

April 30, 1980
Helena, Montana

Mrs. Cheryl Gillespie
560 North Park
Helena, Montana 59601

Dear Mrs. Gillespie:

Earlier this year we discussed the value of an extensive employment study for the State of Montana to facilitate our Residence Main Gain Forecasts.

As time has permitted, I have developed a statistical analysis of each of the nine employment sectors reported by the Research and Analysis Section, Employment Security Division, Department of Labor and Industry, State of Montana, and our own "OTHER" classification.

When we receive the 1980 census data we should be able to integrate this employment study and have a powerful forecasting tool at our disposal.

Very truly yours,



Mark Tiensvold
Assistant Staff Manager
Residence Forecasting

MOT/lv
Attachment

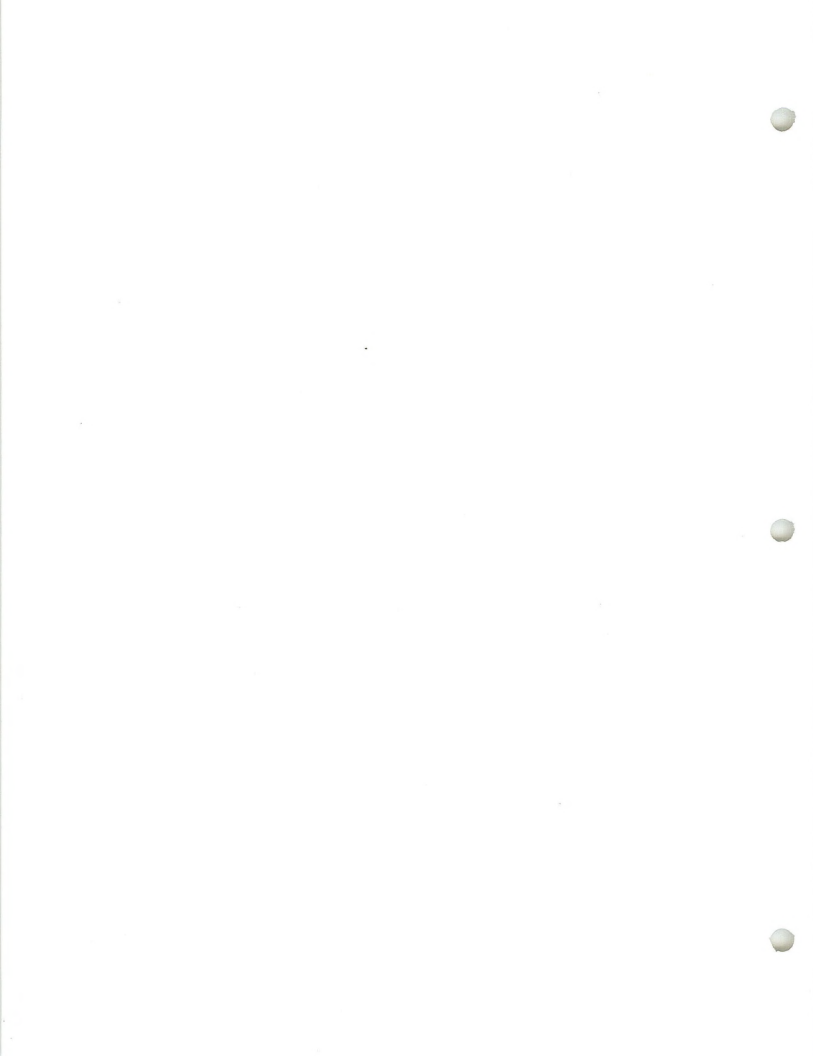
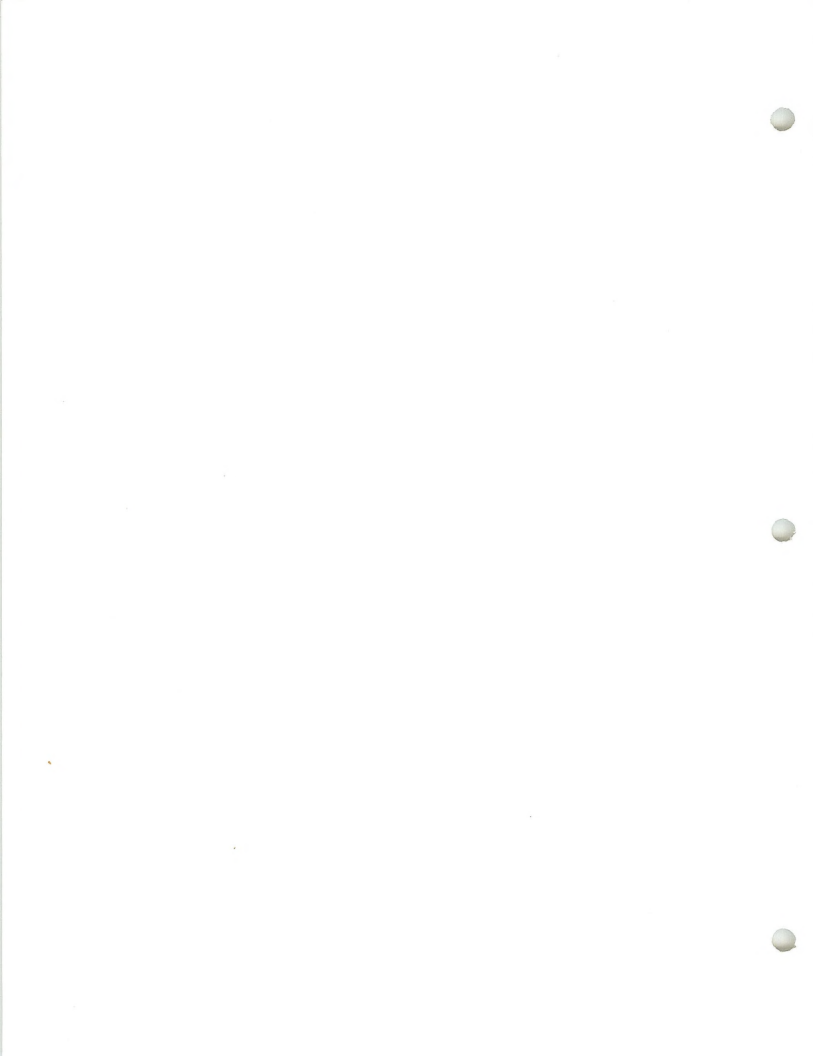


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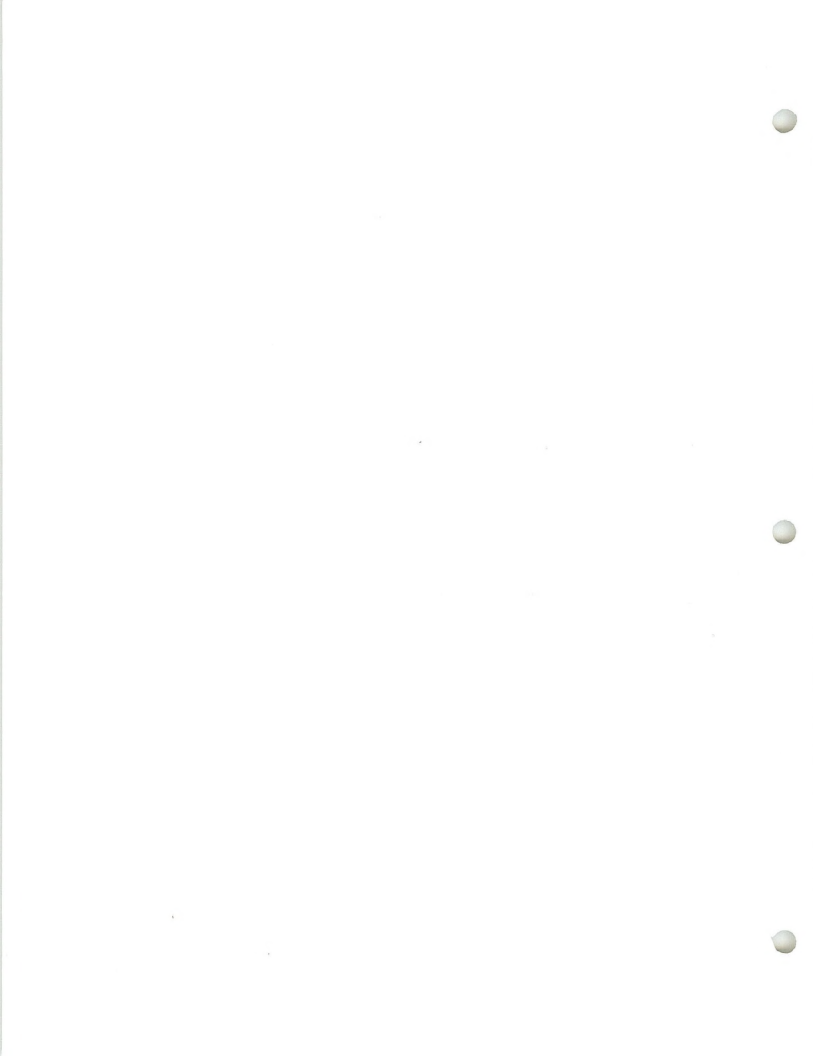


ACKNOWLEDGEMENT

I would like to thank the State of Montana Agencies that were able to supply their valuable time and information.

A special note of thanks goes to Bob Raferty with the Employment Security Division and Phil Brooks with the Department of Community Affairs.

Finally, I would like to thank the personnel at the State of Montana Library for their information research on my behalf.



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MOUNTAIN BELL TELEPHONE CO.

STATISTICAL ANALYSIS
OF
MONTANA EMPLOYMENT

By
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Supervisor
Cheryl Gillespie
Gary Duncan

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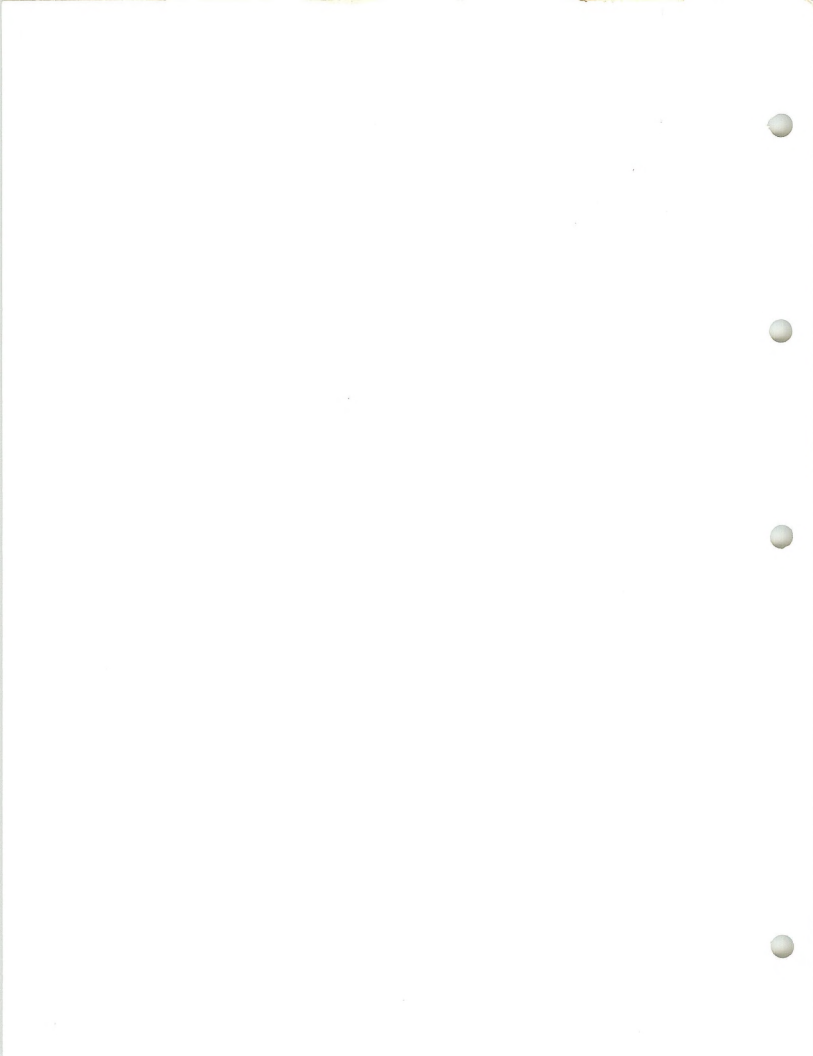
SUMMARY

This employment study can prove to be versatile as a planning tool if the limitations of the projections/forecasts are understood.

Each series under the two digit Standard Industrial Classification Codes was analyzed, not on the individual components in the employment series, but on the statistical nature of the numbers involved in the employment series. Each employment series was plotted on raw data and a seasonally adjusted data. The graphs of the series was visually inspected and characteristics of the employment series determined. An ANOVA Table was produced to give percent of series that is seasonal, trend and irregular. A regression is produced over the data series and the R squared analyzed. R squared gives an indication of the series correlation over time. R squared values close to one indicate a strong correlation to time. R squared close to, or zero indicate no correlation to time.

Without getting involved in mathematical jargon, simply remember that in the T test, the value on the series must be greater than two to be significant. The F test must be greater than four to be significant.

If obvious factors are known to have an effect on the future of a series trend, adjustments were made in the series and referred to as a forecast; employment series with no adjustments are referred to as a projection.



INTRODUCTION

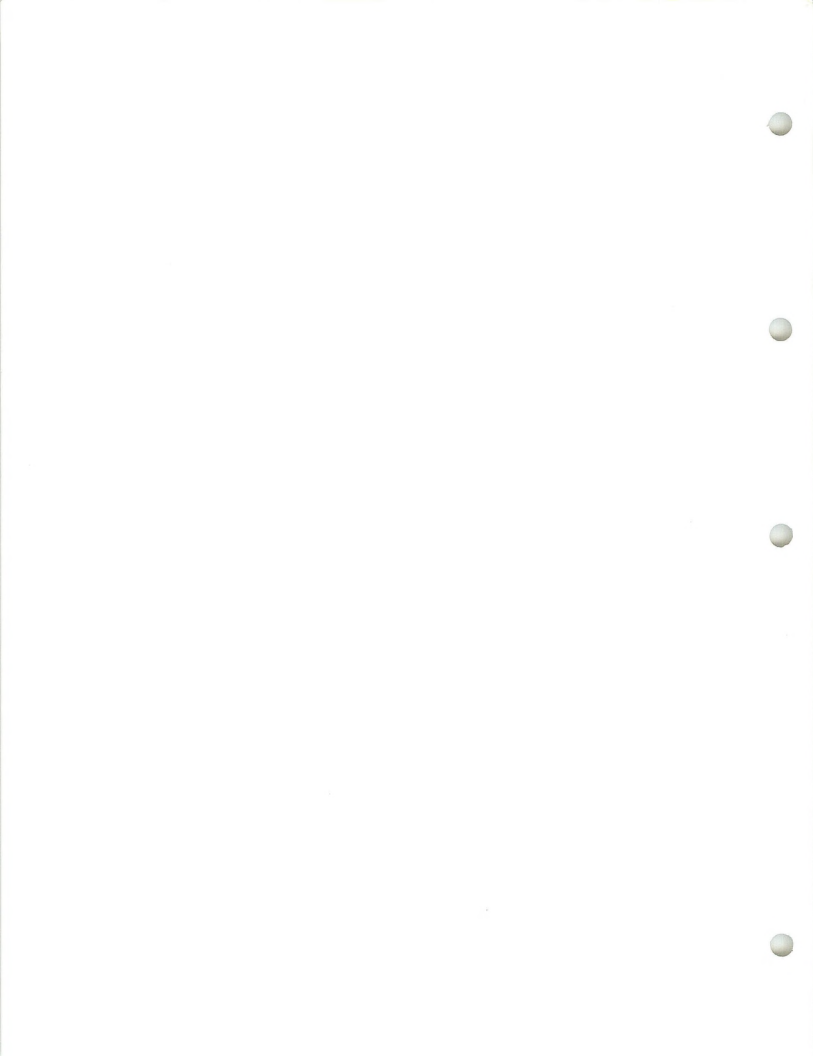
PURPOSE

In development of long-range forecasts of telephone demand, supportive forecasts must be developed. Employment is a basic element in the economic structure of Montana and can be directly related to telephone growth. Ratios are developed from population forecasts (participation ratio) and applied to the employment forecast. Then basic assumptions are developed for telephone growth and then the population, household, and employment forecasts are integrated to formulate a complete long-range forecast for Montana.

The specific purpose of this employment study is for internal telephone company use and is not intended to preempt any federal, state, local government or private employment forecasts or projections.

SCOPE

The methodology of developing this employment study tends more towards a projection rather than a forecast, of employment. Historical data was analyzed to determine each individual data series characteristics. Any unusual outliers in each data series is analyzed to determine the possible causes and if the variation was of a non-recurring nature, the outlier was adjusted in the series. A trend was developed over nineteen years of data and projected out through the year 2000. Any data series that did not appear reasonable was then analyzed on an individual basis and a forecast of that specific series was developed.



Seasonality and business cycles were adjusted out of the future projections. The intent of this study was not to forecast each yearly employment level through the balance of this century, but to give a reasonable level that can be expected in any ten-year time frame. To try to use the enclosed study to compare any one year, or any one month in a year would be beyond the scope of this study. If one were to build into any one employment series the business cycle/seasonality, a comparison to actual employment levels may be appropriate. Over time, a check of accuracy of this study would be devised by checking the actual trend levels with the enclosed projected trend levels.



MONTANA EMPLOYMENT PROJECTIONS

BASIC ASSUMPTIONS

1. Federal, state and local laws will remain relatively constant and have no significant impacts on the employment levels.
2. The Basic Industrial Classification codes will continue throughout the forecast period under the current definitions.
3. No natural disasters or lengthy unreconcilable labor disputes will arise during the forecast period.
4. The national economy will operate under somewhat the same parameters as in the past.
5. No major social changes will occur that would tend to alter women entering the work force and participation ratios will continue to follow historic patterns.
6. The agricultural sector will be able to participate in federal government programs (if not the same programs then programs of a similar nature) over the forecast period.

CHARACTERISTICS OF EMPLOYMENT SECTOR

AGRICULTURE

1. Historic Description

Agriculture has been in a constant state of decline since the 1940's. Conventional trend analysis carries the decline throughout the projection period. A major reason for the decline in agricultural employment has been technological advancements in machinery. High production machinery has enabled the agriculture sector to increase production and decrease employment.

2. Statistical Analysis

The analysis of variance indicates the agricultural data series as 91 percent seasonal, 5 percent trend and 4 percent irregular. Actually, the analysis of variance just depicts the nature of agriculture, since the peak demand for labor is in the summer during the growing season and shows subsequent decline during the winter.

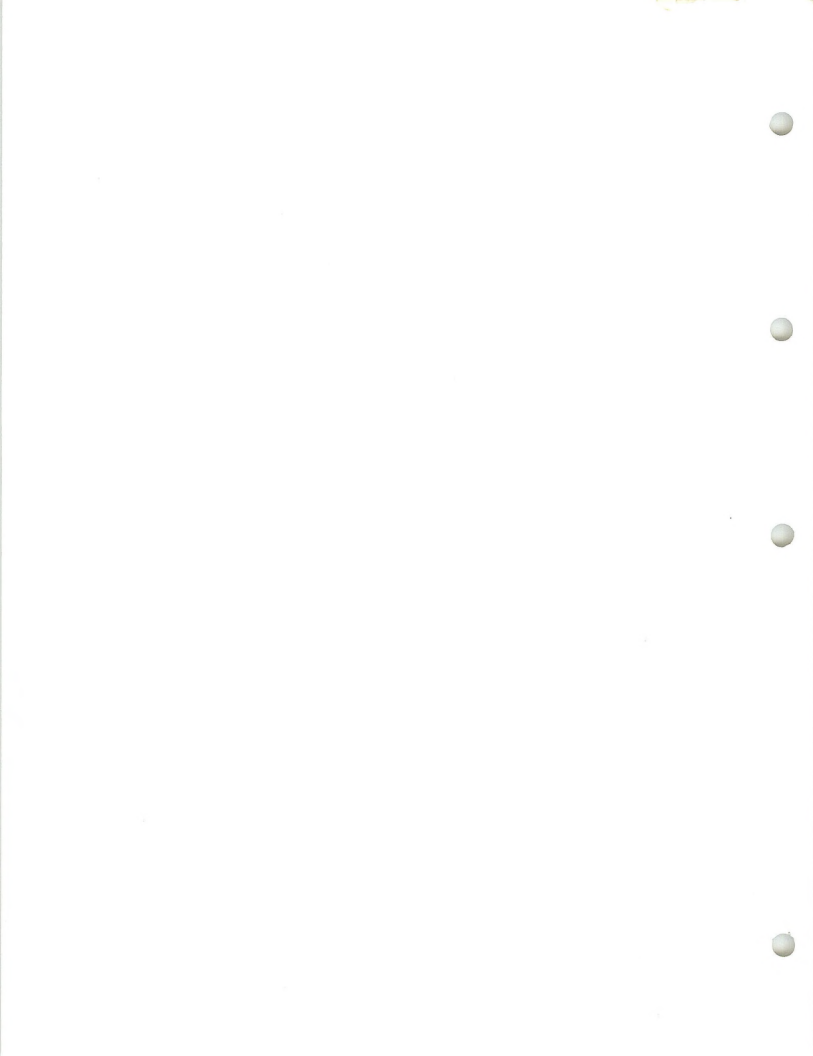
To perform a trend analysis of the agricultural data, adjustments had to be made to the data series to reduce the seasonality. A twelve month moving average increased the trend percentage to 78 percent.

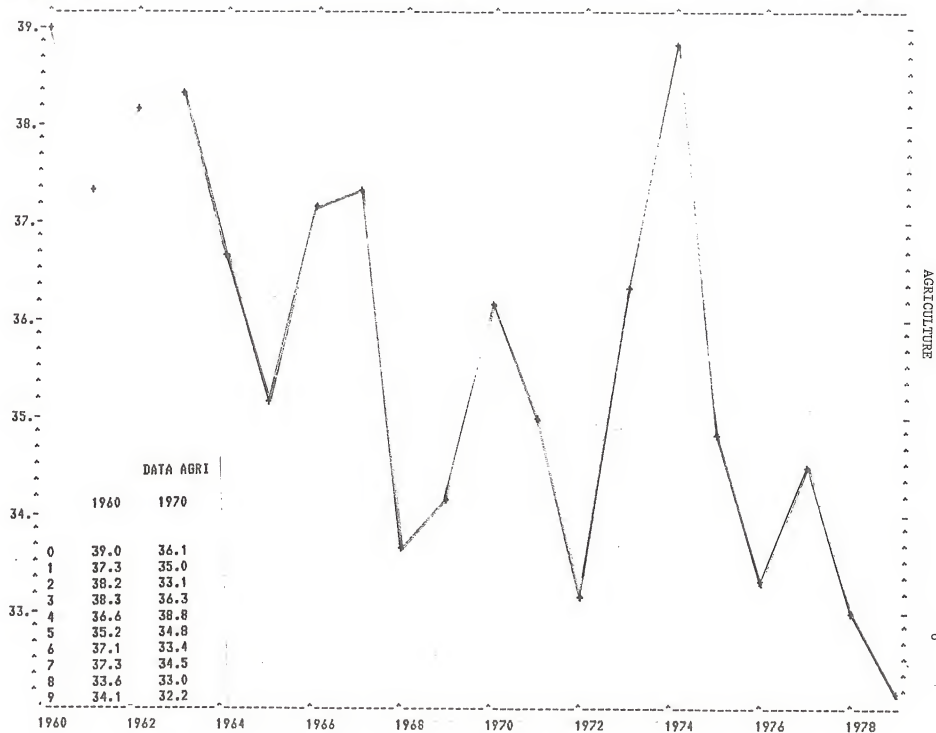
The Bureau of Census X-11 Seasonal Adjustment Program was used to adjust the original data and the trend percentage was increased to 81 percent with the Henderson Curve.

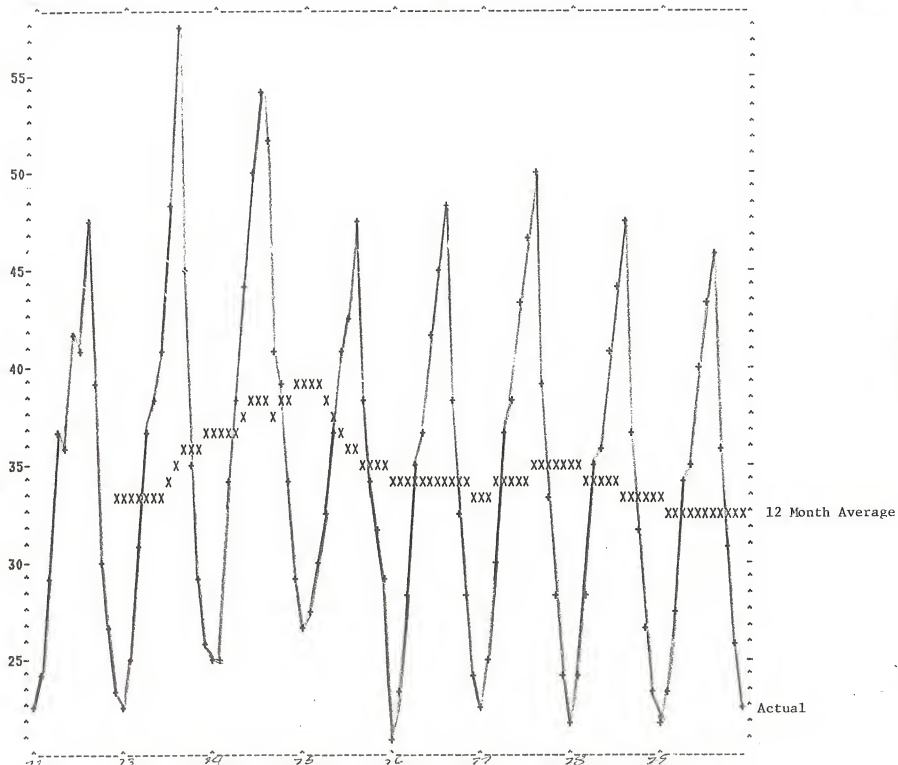
STATISTICAL VALUES

HENDERSON CURVE

R Squared	.2083
T Test	5.1, - 4.9
F Test	24.735







3. Forecast

Trending the Henderson Curve data, the employment levels declined by 500 persons per year until the year 2000.

Introduction of new technology to the agricultural sector has reached a state of saturation. Simply introducing large equipment to increase production and reduce employment levels, cannot go on indefinitely. The forecast for agricultural employment assumes that employment will decline slightly through 1990 and then remain stable throughout the forecast period.

MANUFACTURING

1. Historical Description

Manufacturing has proven to be sensitive to national economic swings. Seasonally adjusted data reveals a swing during the 1974-75 recession from a high of 24.8 thousand jobs in 1973 to a low of 22.1 thousand jobs in 1975. The lumber and woods products industry under the manufacturing category is the sector most sensitive to the National Economy and is directly related to housing starts.

2. Statistical Analysis

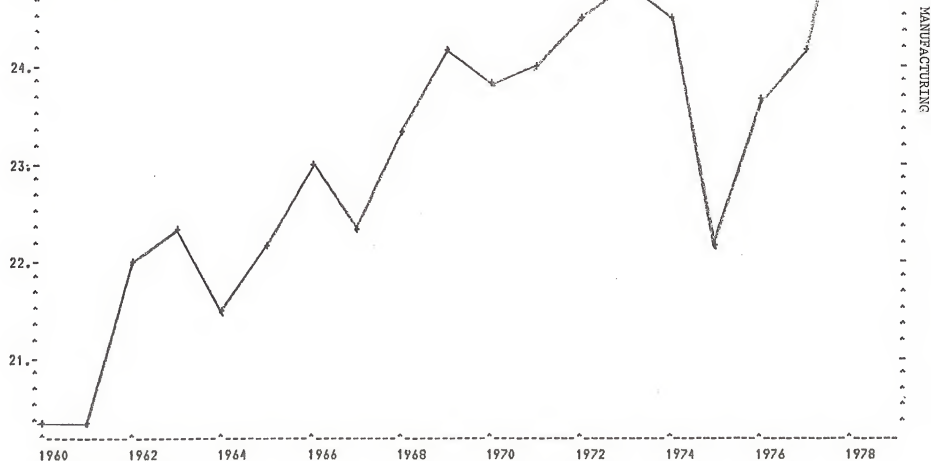
The analysis of variance indicates unadjusted employment series to be 20 percent seasonal, 73 percent trend and 7 percent irregular. Seasonal factor of 20 percent can be attributed largely to the woods products industry as timber harvesting can only be carried out after the spring thaw and before a major snowfall.

A twelve month moving total on the series tends to eliminate the seasonal influence, with a trend value of 89 percent and 10 percent irregular. The irregular factors (one time increases-decreases) can be

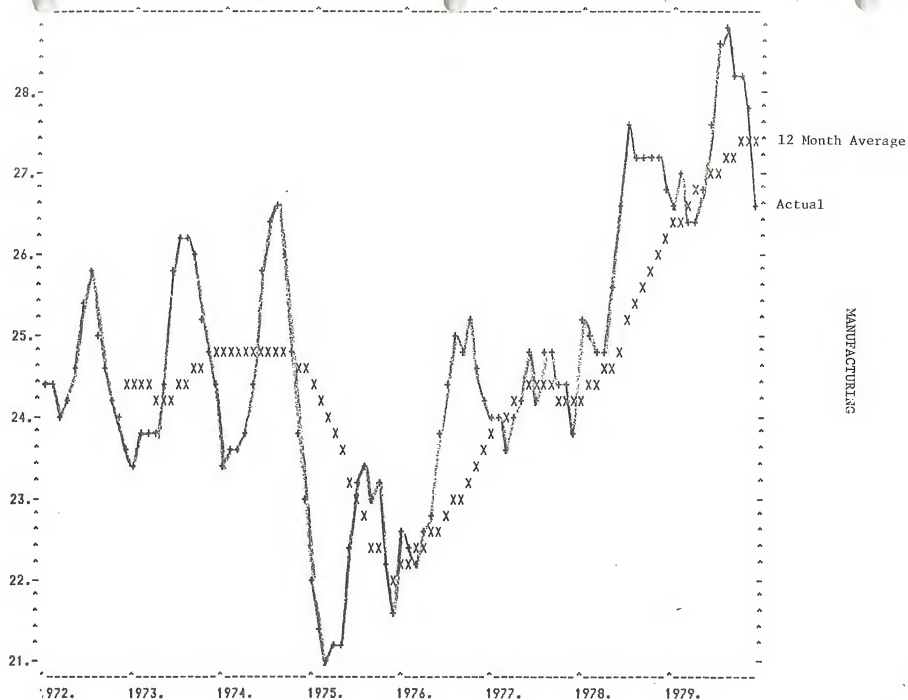


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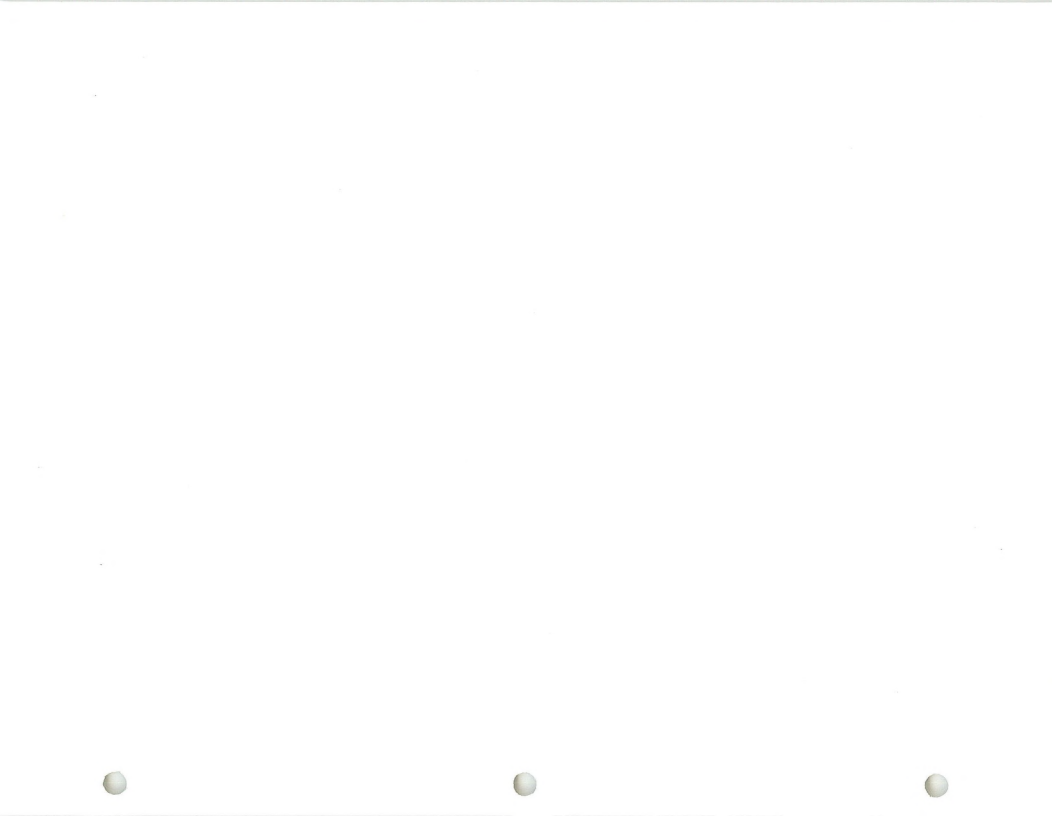
	1960	1970
27.-		
0	20.4	23.8
1	20.4	24.0
2	22.0	24.5
26.-		
3	22.4	24.8
4	21.5	24.5
5	22.2	22.1
6	23.0	23.7
7	22.4	24.2
8	23.3	26.2
25.-		
9	24.1	27.4







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JAN 1972-DEC 1979



largely attributed to the primary metals industry. Labor disputes of varying severity have occurred in 1968, 1971, 1974 and 1977.

STATISTICAL VALUES

Seasonally Adjusted Series

R Squared	.2452
T Test	-4.9927, 5.1928
F Test	26.965

3. Projection

Three trend projections were made: (1) raw series, (2) seasonally adjusted series and (3) yearly data. The series that proved to be the most statistically sound (comparison basis of the three series) was the seasonally adjusted series. No specifics are presently known to significantly change or alter the manufacturing series, so the trend analysis based on the seasonally adjusted series was utilized for an employment projection. Manufacturing employment is projected to increase from year-end job levels of 27.4 thousand to 30.9 thousand jobs by the year 2000.

MINING

1. Historical Description - A. Metal Mining

Historically, metal mining has been the dominant employer in the mining sector and has been subject to major employment swings. As with the manufacturing sector, the mining sector was affected by labor disputes in 1968, 1971, 1974 and 1977. The most dramatic swing occurred in 1968 from a peak of 7.6 thousand jobs in 1966 to a 5.5 thousand jobs in 1968. A swing of 1.2 thousand jobs occurred in a strike in 1971. The trend on metal mining is on a constant downward slope from a high in the mid-sixties.



B. Coal-Oil Gas Extraction

Coal-oil gas extraction is rapidly becoming the dominant employer in the mining sector with 75 percent of the total year-end 1979 employment.

Lewis and Clark reported open coal seams in Montana in 1805. By 1918, 4.5 million tons was being produced in Montana with actual peak production of 4.8 million tons in 1944. Production fell to .3 million tons by 1958 as other forms of energy became dominant.¹

Oil and gas extraction have just recently become an active employer with major capital expenditures being made in the Williston-Basin area of eastern Montana. New discoveries in the Overthrust Belt in western Montana has opened new potential for increased employment.

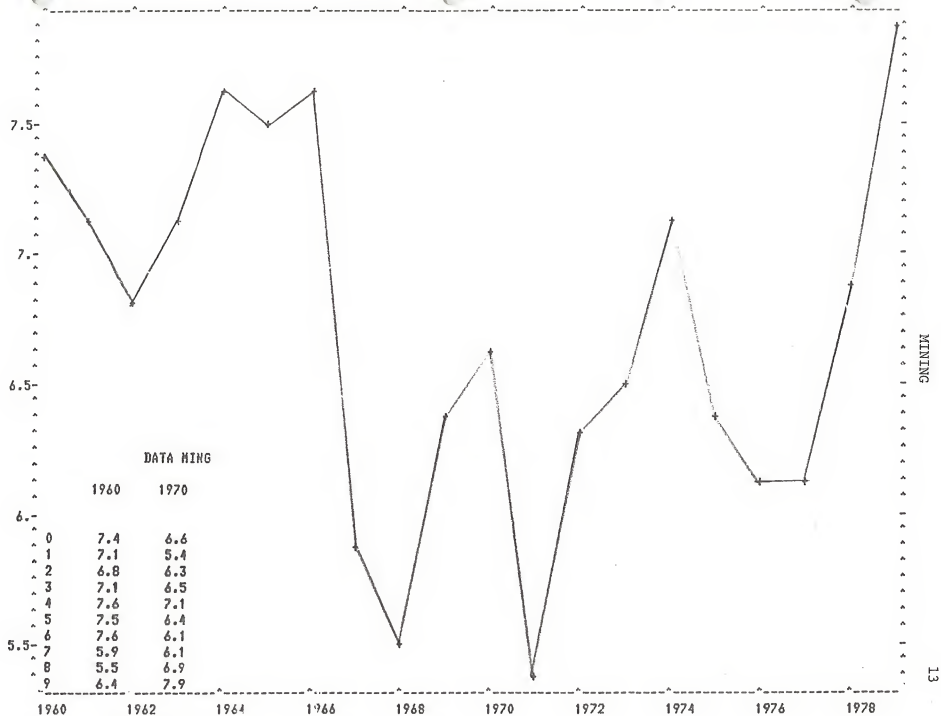
2. Statistical Analysis - A Metal Mining

The analysis of variance on the new data indicates a low seasonal effect of 7 percent, trend of 74 percent, and irregular of 19 percent. The higher than normal irregular factor can be attributed to the irregular intervals/magnitudes of labor disputes. A twelve month moving total to seasonally adjust the data series produces a two percent seasonal, 86 percent trend and 13 percent irregular.

The seasonally adjusted series was not used, as the values indicate:

Seasonally Adjusted Series	Raw Series
R Squared .0514	.1567
T Test -2.00, 2.12	-4.06, 4.18
F Test 4.5	17.5





DATA MINING

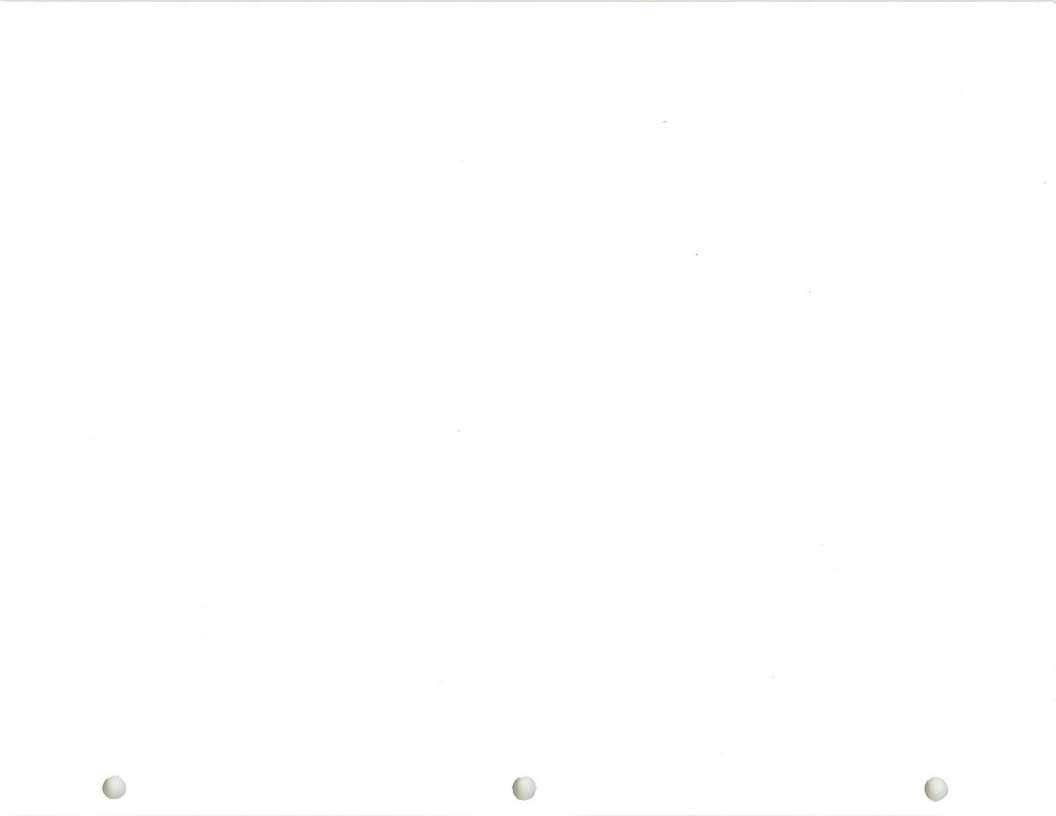
1960 1970

0	7.4	6.6
1	7.1	5.4
2	6.8	6.3
3	7.1	6.5
4	7.6	7.1
5	7.5	6.4
6	7.6	6.1
7	5.9	6.1
8	5.5	6.9
9	6.4	7.9

1 + DATAMING VS TIME
1960-1979

MINING

13





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R squared value of Raw series is closer to an absolute value of one, indicating that the Raw data series has a higher correlation to time than the seasonally adjusted series.

B. Coal-Oil Gas Extraction

Statistical analysis of coal-oil gas extraction would not be valid because very little historical data is available. A different approach was taken because all known energy development projects were analyzed on an individual basis and employment figures overlaid to the metal mining trend value. A complete description of methodology is presented in the Appendix.

3. Forecast

The trend value of mining employment from 1947 to the present was extended through the forecast period. As the energy scenario is overlaid onto the metal mining trend levels, employment levels tend to fall from 1979 levels as metal mining's employment is reduced. But then the employment levels tend to increase as the specific energy developments come on line.

CONSTRUCTION

1. Historical Description

Construction employment has been significantly influenced by construction projects with heavy capital expenditures by the federal government or large corporations. The most recent large construction project being construction of two 350 megawatt, coal fired electrical generating plants at Colstrip, Montana. Employment levels surged during Colstrip construction to 13.5 thousand in 1974 to 12.1 thousand in 1975 after completion of Unit 2.



2. Statistical Analysis

Analysis of variance indicated that the construction industry is 58 percent seasonal, 39 percent trend and 3 percent irregular. Months of heaviest employment have historically been July through September. Because the construction employment levels are directly related to weather, the seasonal influence must be adjusted out. A twelve month moving total reduced seasonality to 2 percent trend to 94 percent and irregular to 5 percent.

STATISTICAL VALUES

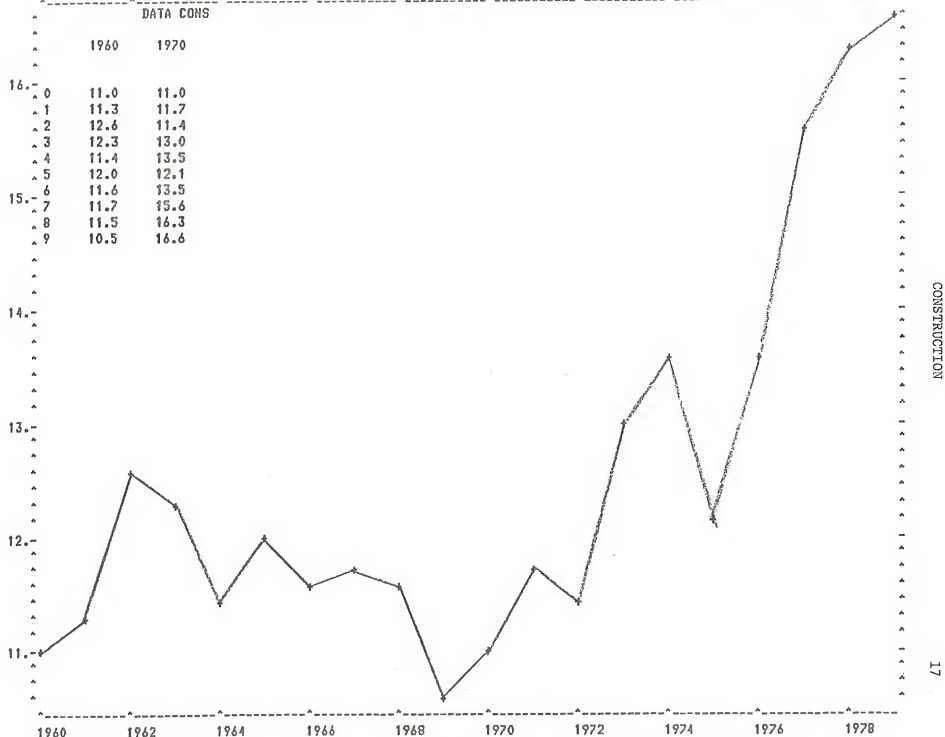
Twelve Month Moving Total

R Squared	.7885
T Test	17.42, 17.59
F Test	309.42

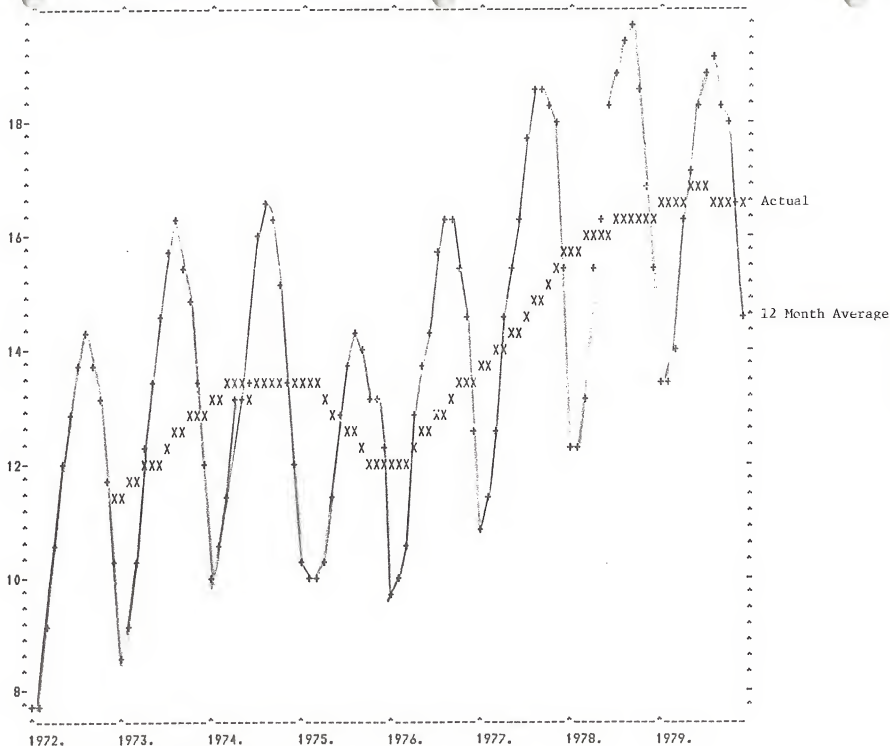
3. Forecast

The construction industry has been on the upward trend and the most statistically sound trend (twelve month moving total) was projected to the year 2000. As in mining, the energy scenario is overlaid onto the trend to produce a forecast of construction employment.











TRANSPORTATION, COMMUNICATIONS, ELECTRIC, GAS AND SANITARY SERVICES
(TCU)

1. Historical Analysis

Historically the TCU sector has been a relatively stable series. A detailed analysis of each increment of the TCU series is beyond the scope of this study, so the numeric series itself was evaluated. From the beginning of the 1960's a decline was noted in the TCU until 1964 and then a slight surge was noted until 1967. From 1967 to 1970 the decline in employment continued and from 1970 to present a complete turnaround was noted with continual growth through 1979.

2. Statistical Analysis

The analysis of variance indicates the TCU series to be 13 percent seasonal (June, July, August), 84 percent trend and 3 percent irregular. Seasonally adjusting the series reduces the seasonal factor to 3 percent, trend is increased to 95 percent and irregular maintains at 3 percent.

STATISTICAL VALUES

Seasonally Adjusted Series

K Squared	.8139
T Test	-18.72, 19.05
F Test	363.062

3. Projection

Four data series were analyzed and the most statistically sound series (comparison between the four existing series) was the seasonally adjusted series. Trend projections on the TCU series show an increase



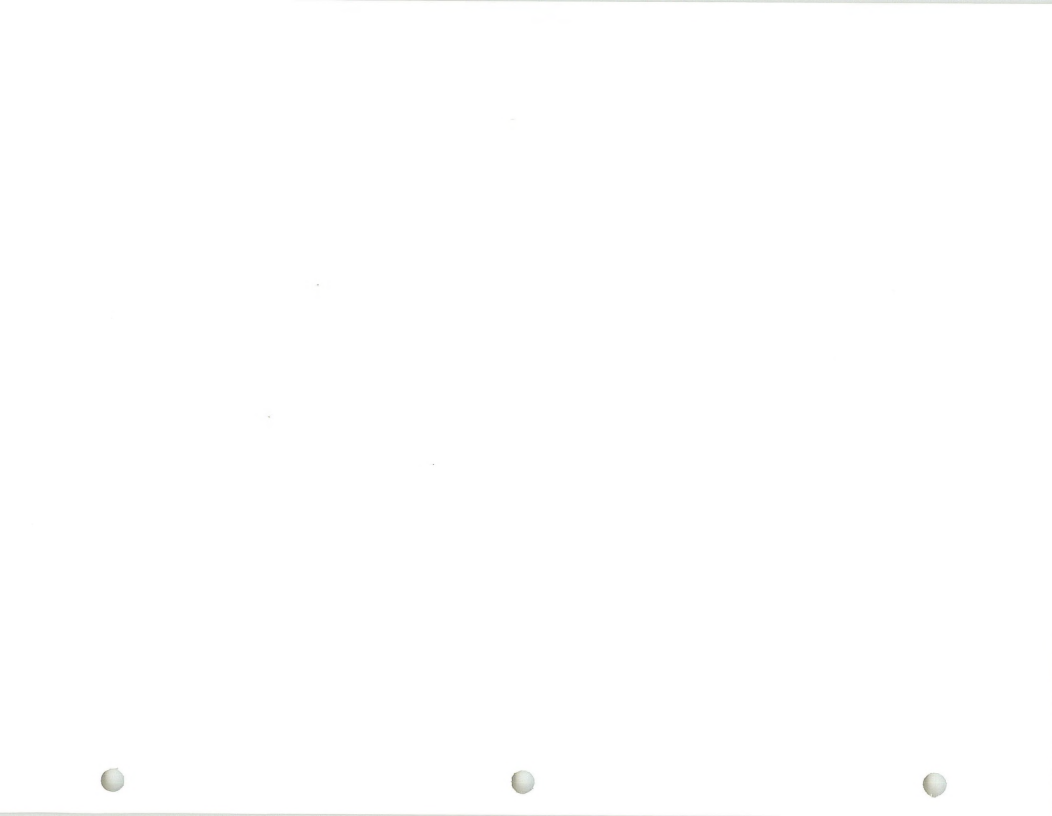
in employment from 23.2 thousand jobs in 1979 to 34.0 thousand by the turn of the century. An energy impact was overlaid that included persons employed by the utilities companies.



	DATA TCUS	
	1960	1970
0	19.0	17.4
1	18.3	17.7
2	17.9	17.9
3	17.6	18.7
4	17.4	19.5
5	17.5	19.0
6	17.7	19.2
7	17.8	20.2
8	17.6	21.6
9	17.6	23.2



TRANSPORTATION, COMMUNICATIONS, UTILITIES



WHOLESALE AND RETAIL TRADE

1. Historic Description

Since 1962 the wholesale and retail trade (TRADE) sector has been on a stable growth pattern. The 1974-75 recession did slow growth slightly, but recovery in growth levels was almost immediate. The trade sector's growth can be attributed to the increase in the individual's disposable income and Montana's historic lack of trade facilities. New shopping centers in almost every major city have tended to fill the facilities void.

2. Statistical Analysis

The analysis of variance for trade proves the stability of the data series with a 12 percent seasonal factor, 86 trend and 2 percent irregular. Seasonally adjusting the series puts the seasonal factor to 2 percent, trend of 97 percent and irregular at 1 percent. The original data series has a classic example of an outlier in mid-1977.

STATISTICAL VALUES

Seasonally Adjusted Series

R Squared	.9440
T Test	-36.99, 37.39
F Test	1397.98

3. Projection

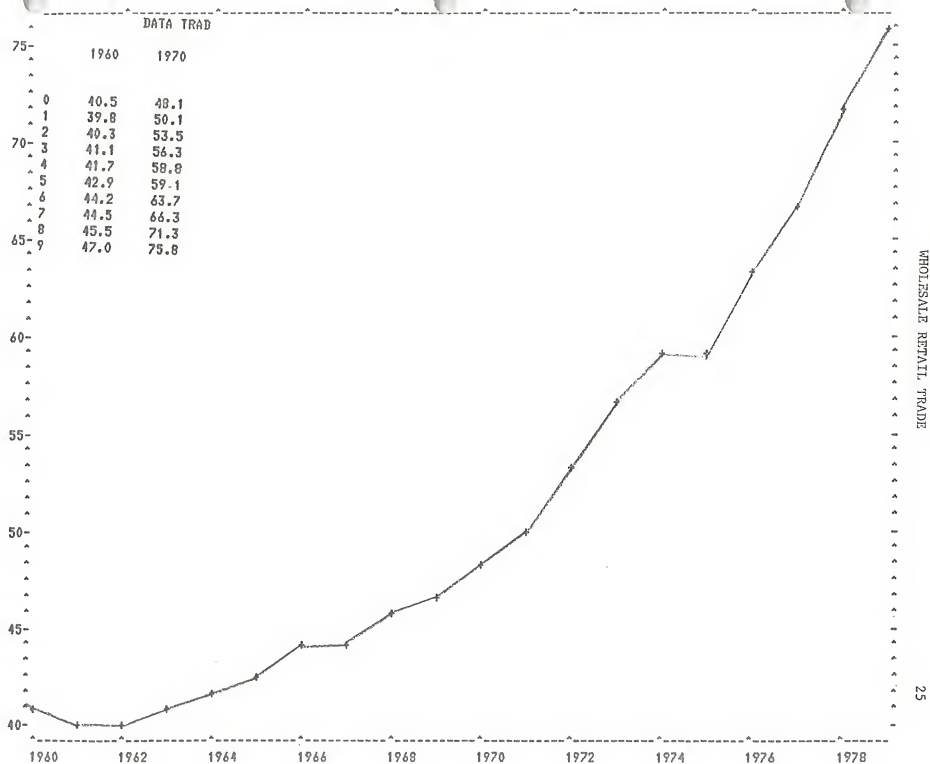
Under the guidelines of the basic assumptions, that the economy will remain basically the same, a trend projection was appropriate for

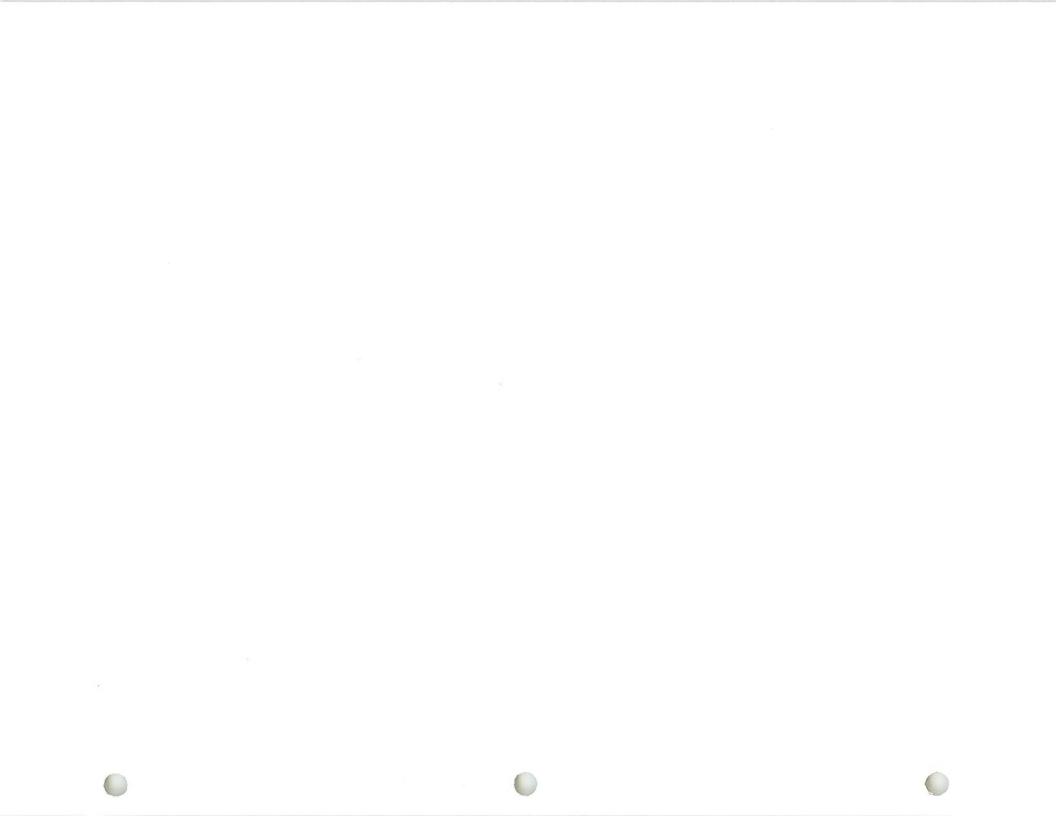
the trade series. Trend projections for trade show growth from the 1979 levels of 75.8 thousand jobs to 132.5 thousand jobs by the year 2000.

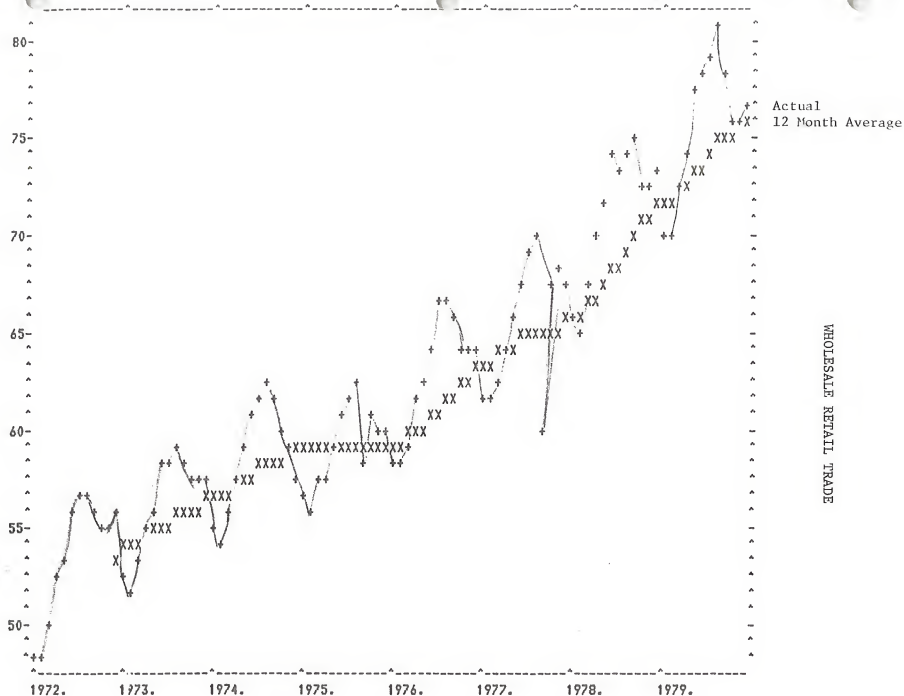


DATA TRAD

	1960	1970
0	40.5	48.1
1	39.8	50.1
2	40.3	53.5
3	41.1	56.3
4	41.7	58.8
5	42.9	59.1
6	44.2	63.7
7	44.5	66.3
8	45.5	71.3
9	47.0	75.8

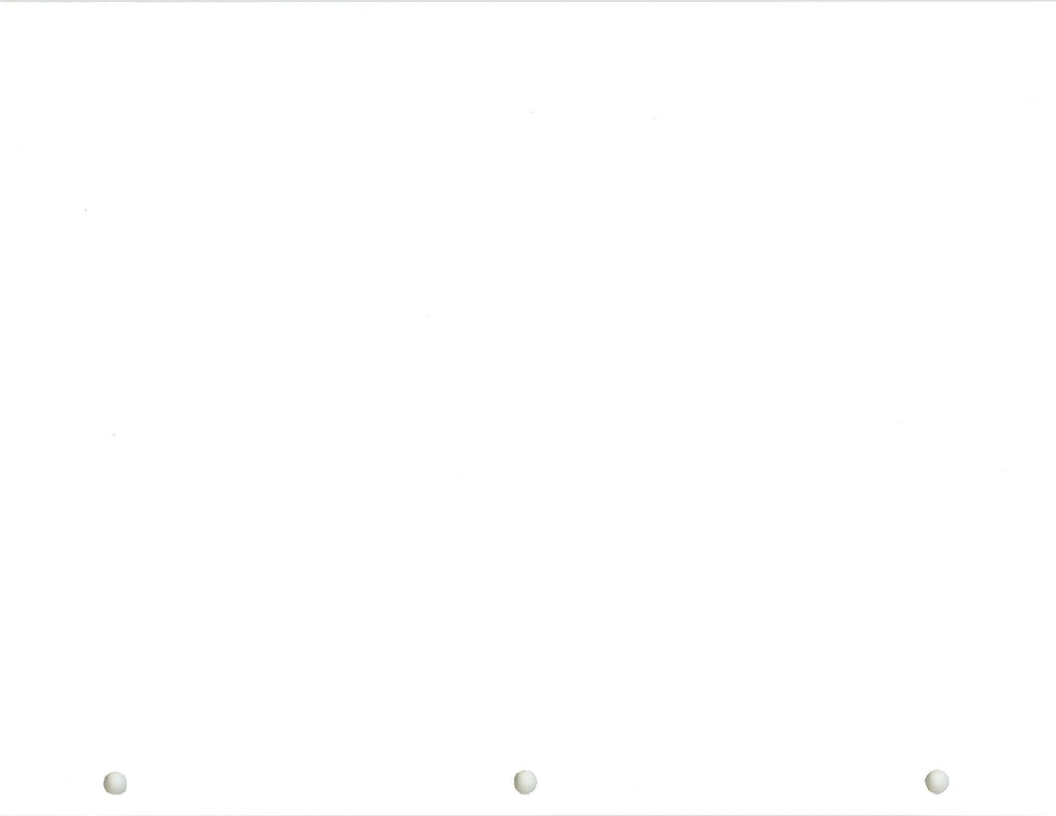






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JAN 1972-DEC 1979

>TSTB DATA TRAD



FINANCE, INSURANCE, AND REAL ESTATE

(FIRE)

1. Historical Description

The FIRE series covers a broad spectrum of financial institutions. Traditionally, financial institutions have been known as established secure businesses which are not subject to quick or impulsive change.² The FIRE data series has historically been one of stable, even growth.

2. Statistical Analysis

Very little difference is noted between the seasonally adjusted FIRE data series and the original data series in the Analysis of Variance Table.

	Seasonally Adjusted	Raw Data
Seasonal	3%	4%
Trend	96%	93%
Irregular	1%	3%

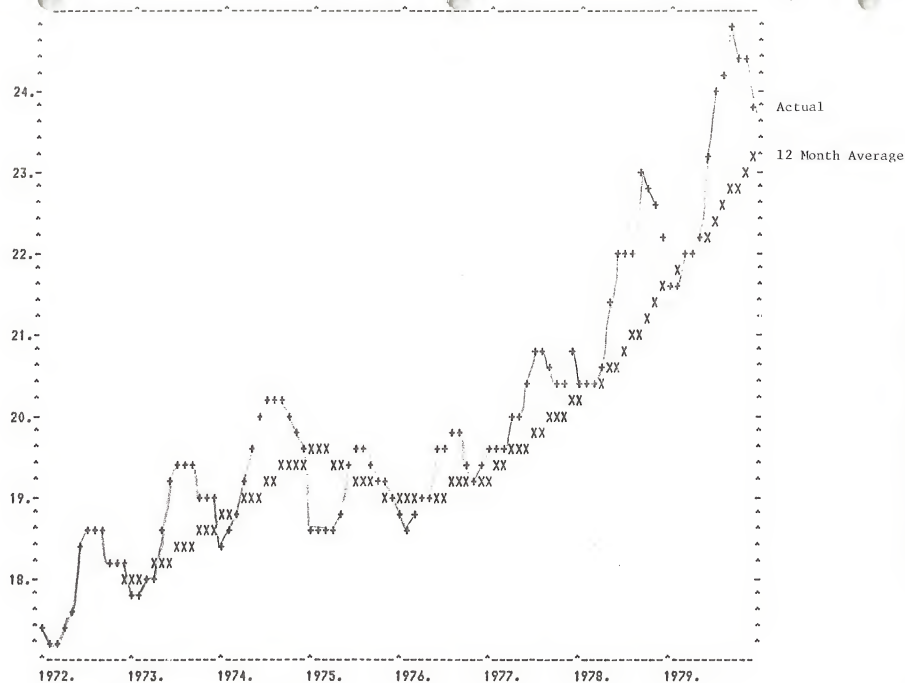
STATISTICAL VALUES

Seasonally Adjusted Series

R Squared	.9494
T Test	-39.09, 39.46
F Test	1557.25

3. Projection

Because of the historic stability of the FIRE series a trend projection was developed. Growth in jobs is expected to increase from 13.6 thousand in 1979 to 24.3 thousand by the turn of the century.



TRANSPORTATION, COMMUNICATIONS, UTILITIES

22

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 JAN 1972-DEC 1979

>TSTB DATA CON@@TCUT

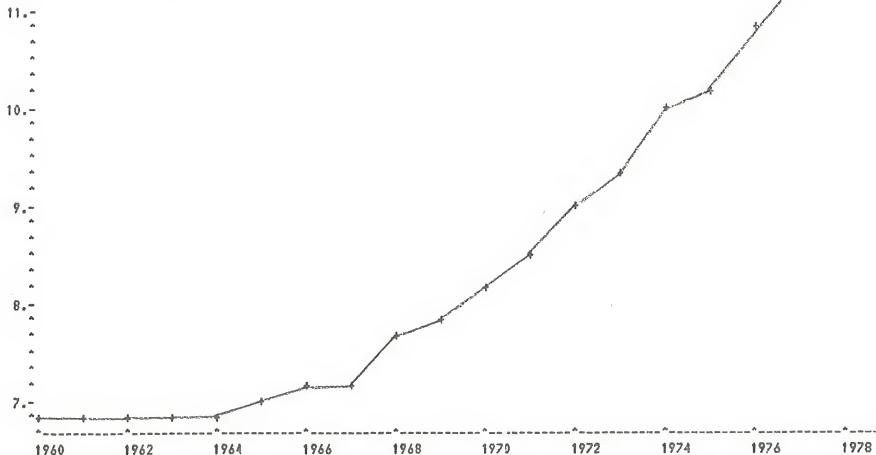
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DATA FIRE

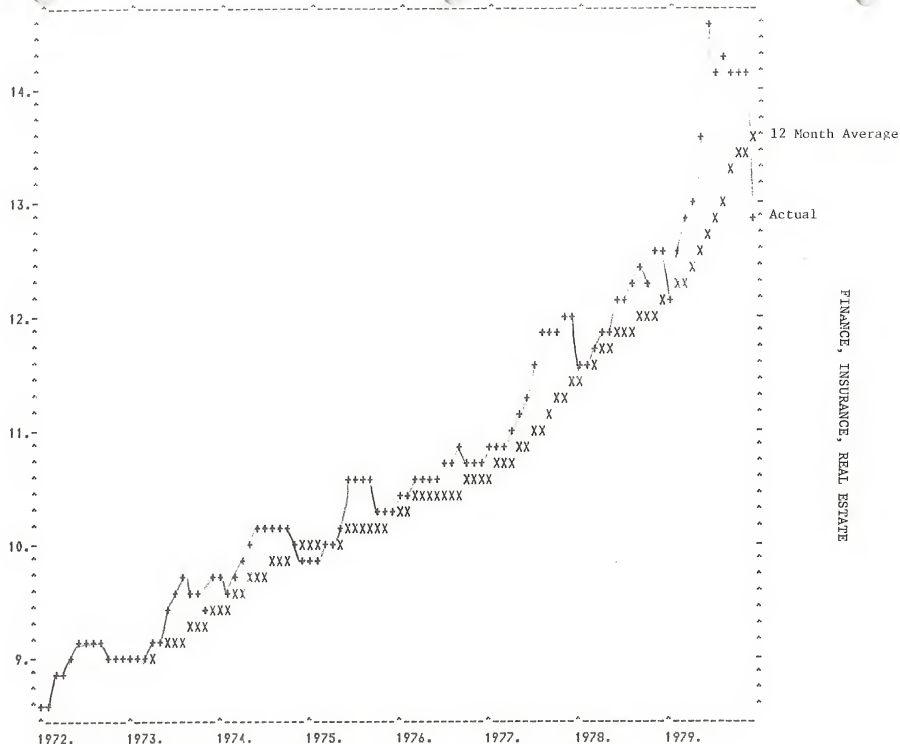
1960 1970

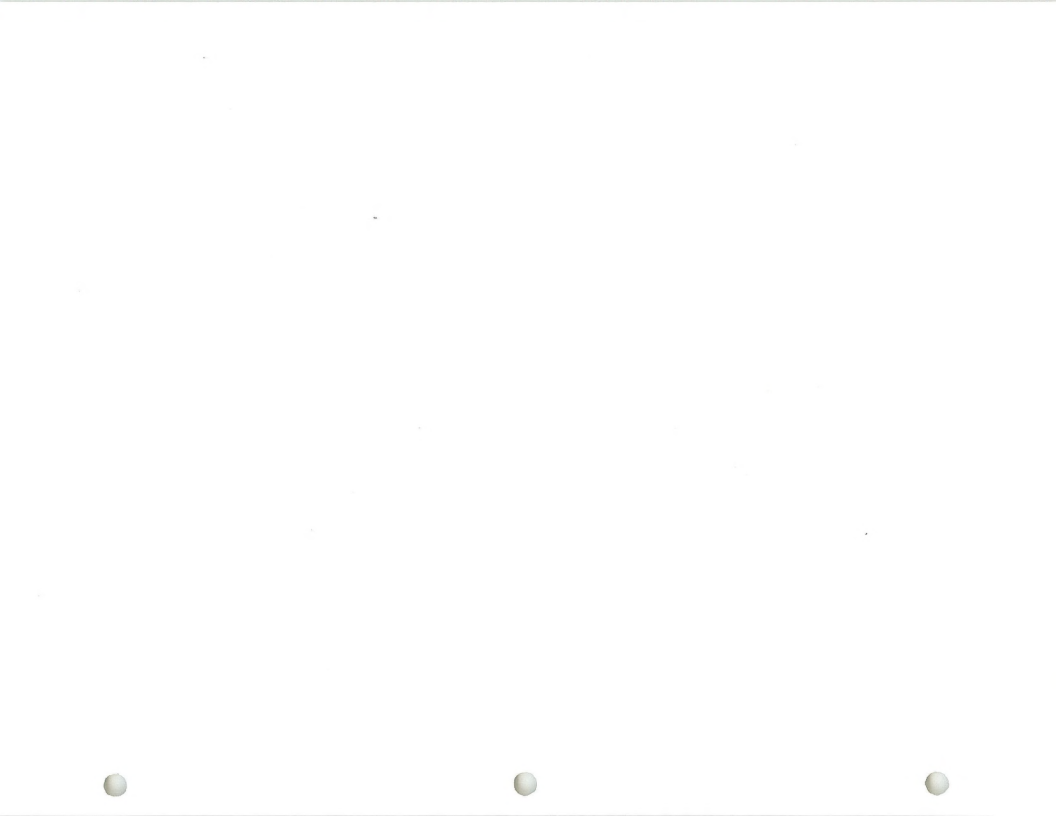
13.	0	6.9	8.1
1	1	6.8	8.5
2	2	6.8	9.0
3	3	6.8	9.4
4	4	6.9	10.0
12.	5	7.0	10.2
6	6	7.2	10.8
7	7	7.2	11.4
8	8	7.6	12.1
9	9	7.9	13.6



FINANCE, INSURANCE, REAL ESTATE







SERVICES

1. Historical Description

The service center is very similar to the TRADE series because growth has been strong/continues and the services data series is relatively stable. Constant growth can be attributed to increases in the individual's disposable income and greater availability of service rendering facilities.

2. Statistical Analysis

The Analysis of variance indicates the service series to be relatively stable with a bit of seasonality. Seasonal factor of 9 percent, trend 90 percent and irregular of 1 percent and the seasonally adjusted series shows seasonality of 2 percent, trend at 98 percent and minimal irregularity.

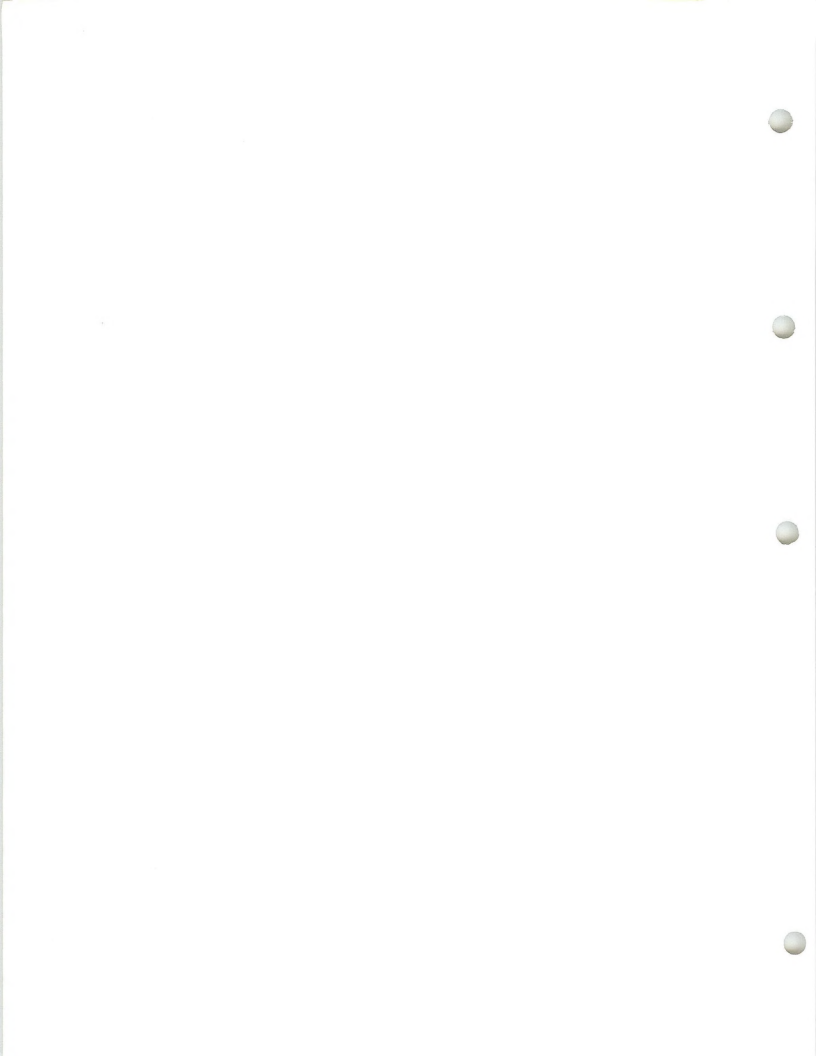
STATISTICAL VALUES

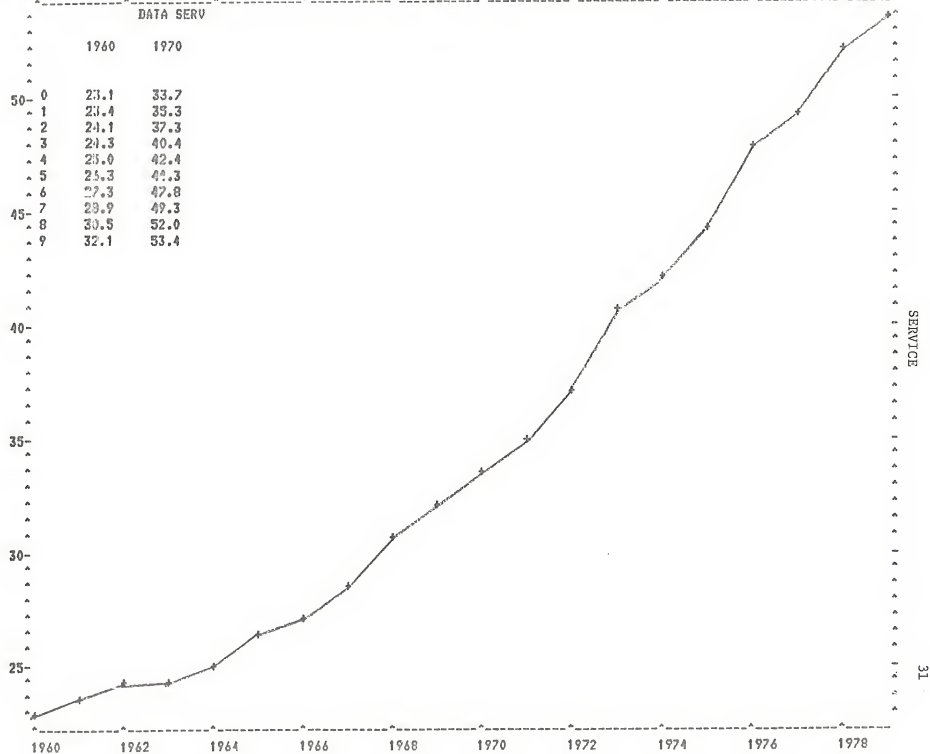
Seasonally Adjusted Series

R Squared	.9973
T Test	-173.74, 175.49
F Test	20795.202

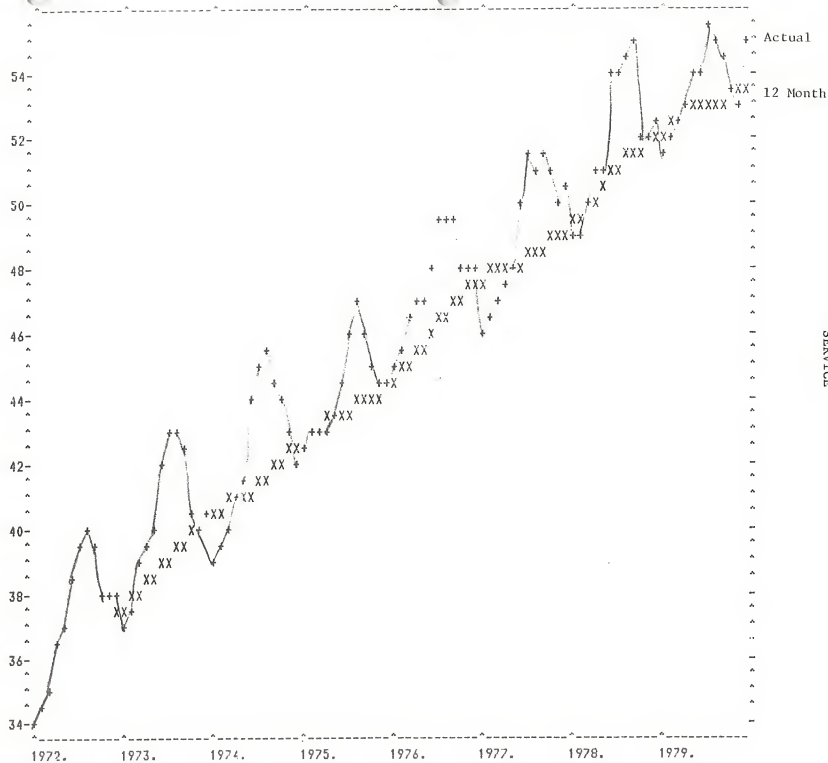
3. Projections

Again, because of the stability of the service series a trend projection was developed with an energy impact overlay. Energy impact series is derived from the jobs required in a community to handle energy development growth, such as fire protection, police, etc.











PUBLIC ADMINISTRATION

(Government)

1. Historical Description

Federal, state and local governmental agencies have been growing steadily since the early 1960's. Added governmental regulations and responsibilities have required ever-increasing employment levels. Different presidential administrations have had a significant effect on employment levels in the governmental sector.

2. Statistical Analysis

The raw data series and the seasonally adjusted governmental employment series were relatively stable according to the analysis of variance.

	Raw Data Series	Seasonally Adjusted Series
Seasonal	3%	1%
Trend	93%	97%
Irregular	4%	2%

STATISTICAL VALUES

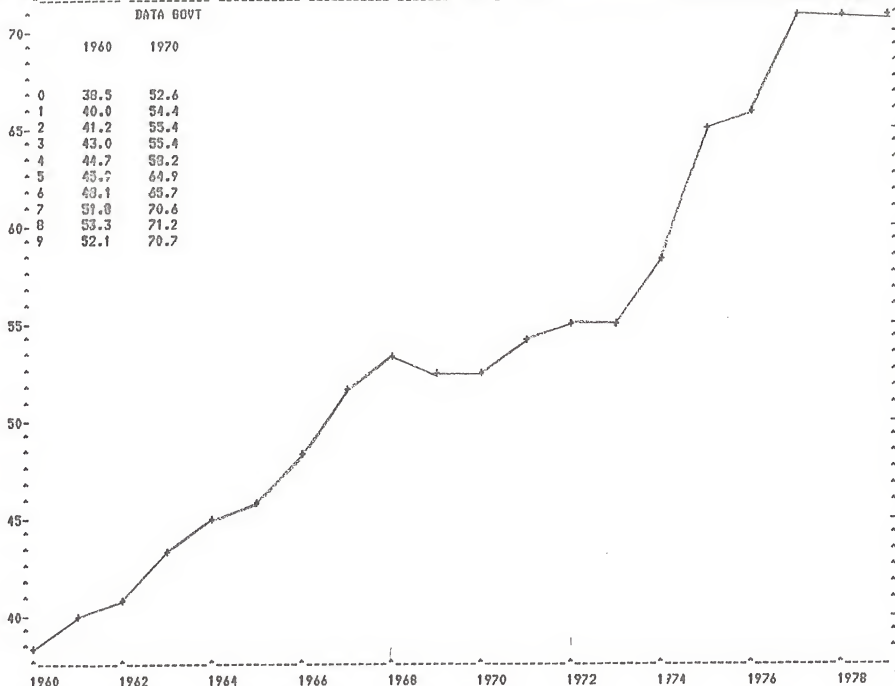
Seasonally Adjusted

R Squared	.9208
T Test	30.72, 31.07
F Test	965.62

3. Projection

A trend projection was developed on a seasonally adjusted series from 1947. Using all available data to develop a trend projection would tend to average different presidential administrations policies on employment and give a trend picture of future employment levels.





1 + DATAGOVY VS TIME
1960-1979





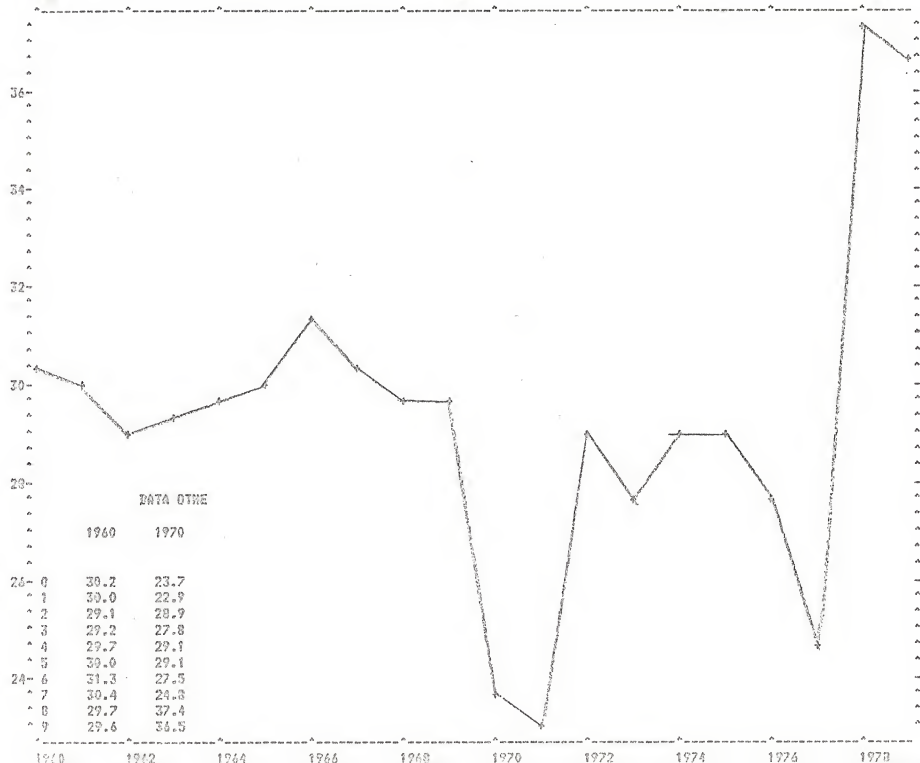


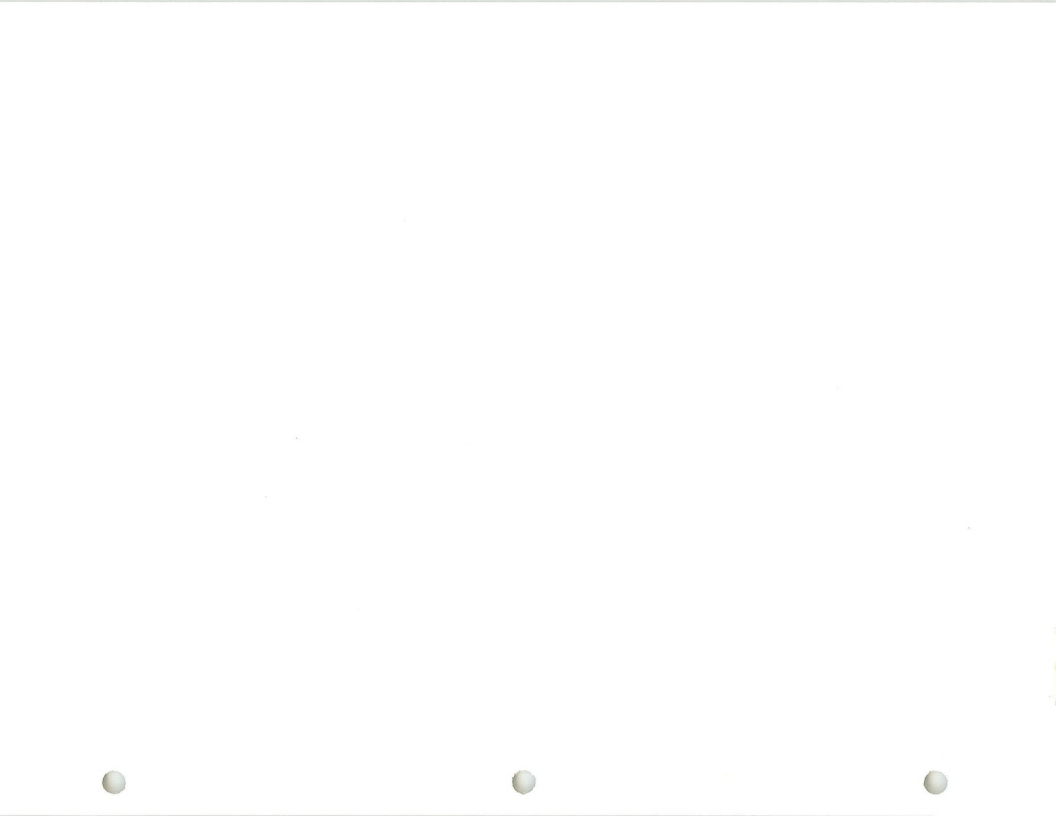
OTHER

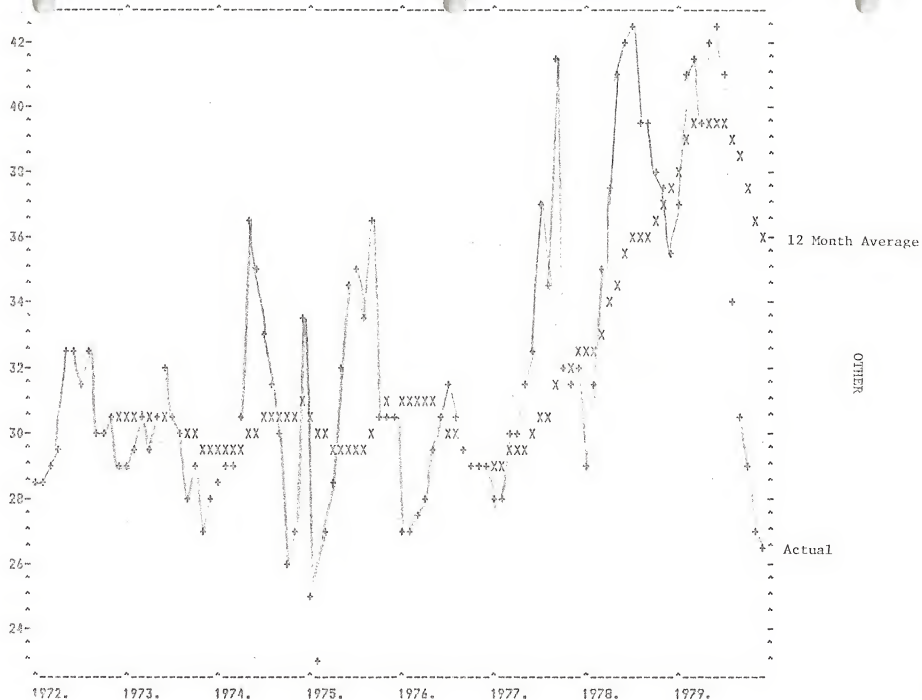
1. Historical Description

The Other series is an extremely "SOFT" number and should not be relied upon. The State of Montana provides employment data on a monthly basis and a complete definition can be found in the SIC portion of the Appendix under Non-Classifiable Establishments. We use the OTHER series mainly for internal purposes. We are aware of the nature of the number and use the number accordingly.

As the historical graph depicts, the series is very erratic and unstable.

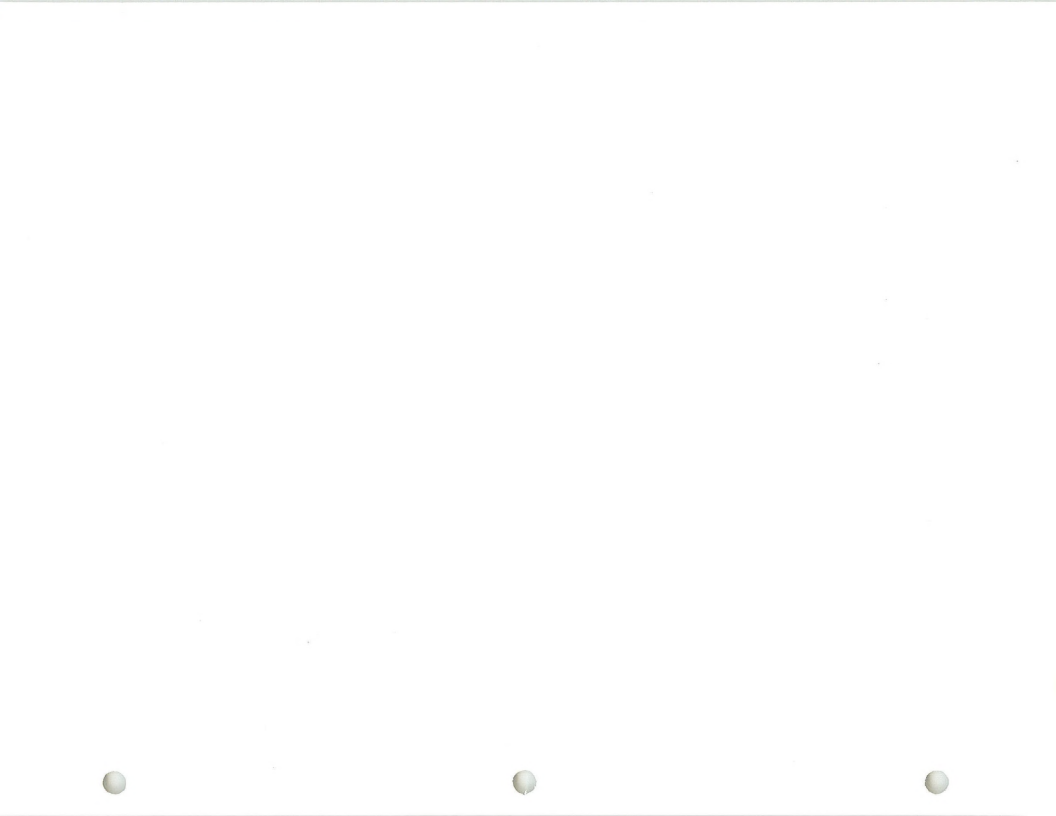


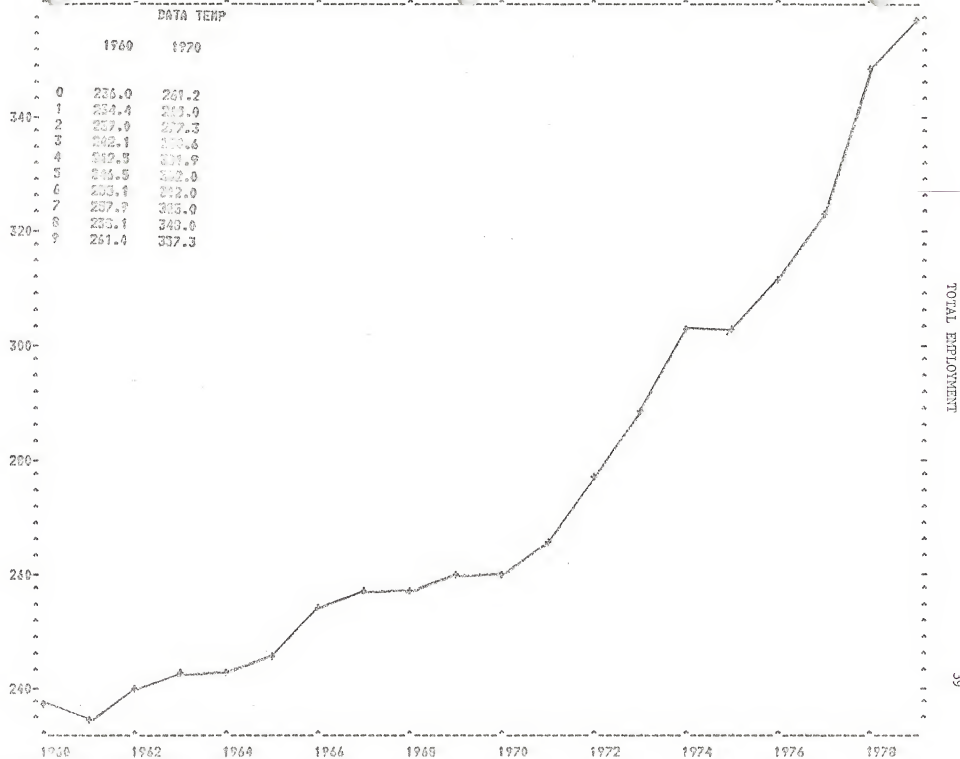


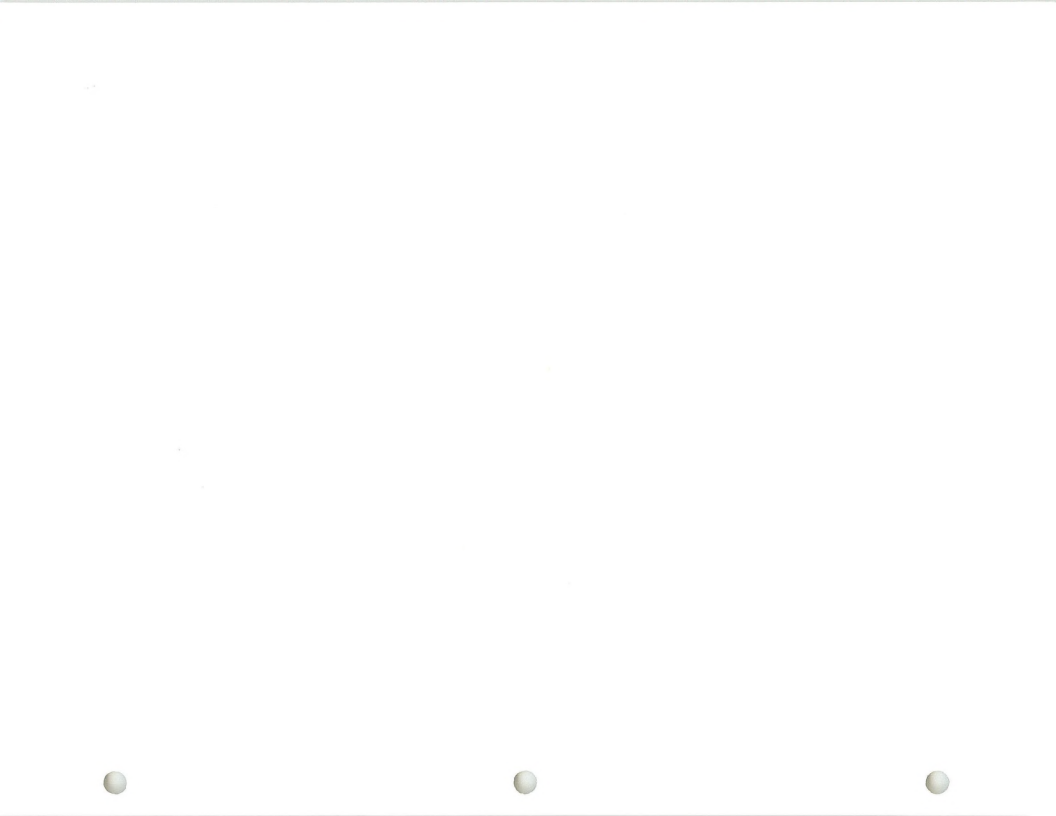


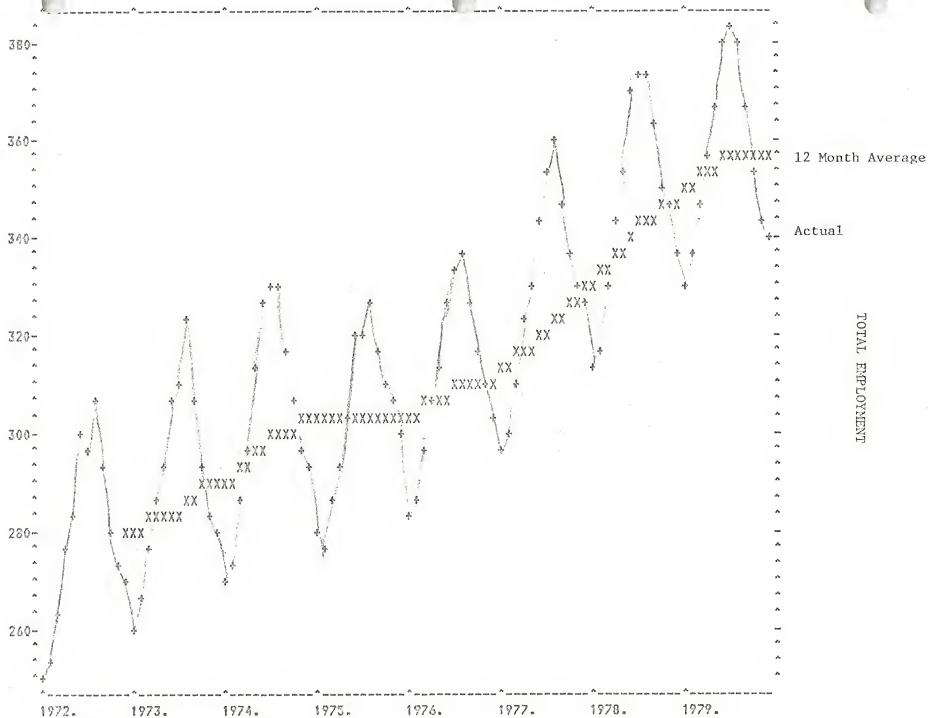
1 + DATAONE 2 X DATATWO VS TIME
JAN 1972-DEC 1977

>TST6 DATA ONE





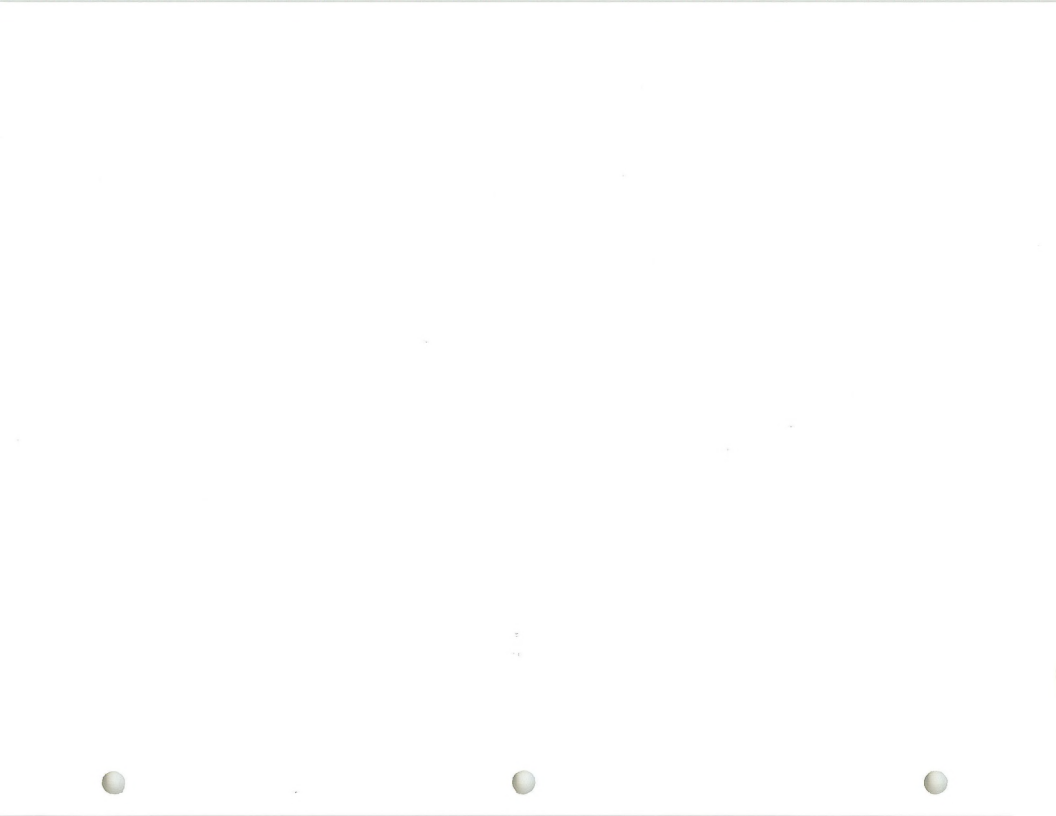




1 + DATATENP 2 X DATATEM VS TIME

JAN 1972-DEC 1979

>ISTR DATA TEMP



CONCLUSION

Statistical analysis of each individual employment series revealed that some series were very stable and the trending method of forecasting/projection would be a reliable indicator of the future employment levels in that specific series. Then again, other employment series tended to be very erratic and the statistical approach of projection would be an unreliable, at best, indicator of future employment levels. A hint of the reliability of a curve can be determined by the R squared value included under each specific heading. An R squared value closer to 100 percent is a more reliable projection of employment levels than R squared values closer to zero.

Table V includes the results of this employment study in a numeric display. The percentage of total basic employment to total employment tends to fluctuate between 16 and 18 percent over the forecast/projection period, but the addition of large construction forces included in the energy impact scenario tends to distort the percentage.

Employment levels are expected to increase 109 percent by the turn of the century from 1970 levels.

RECOMMENDATIONS

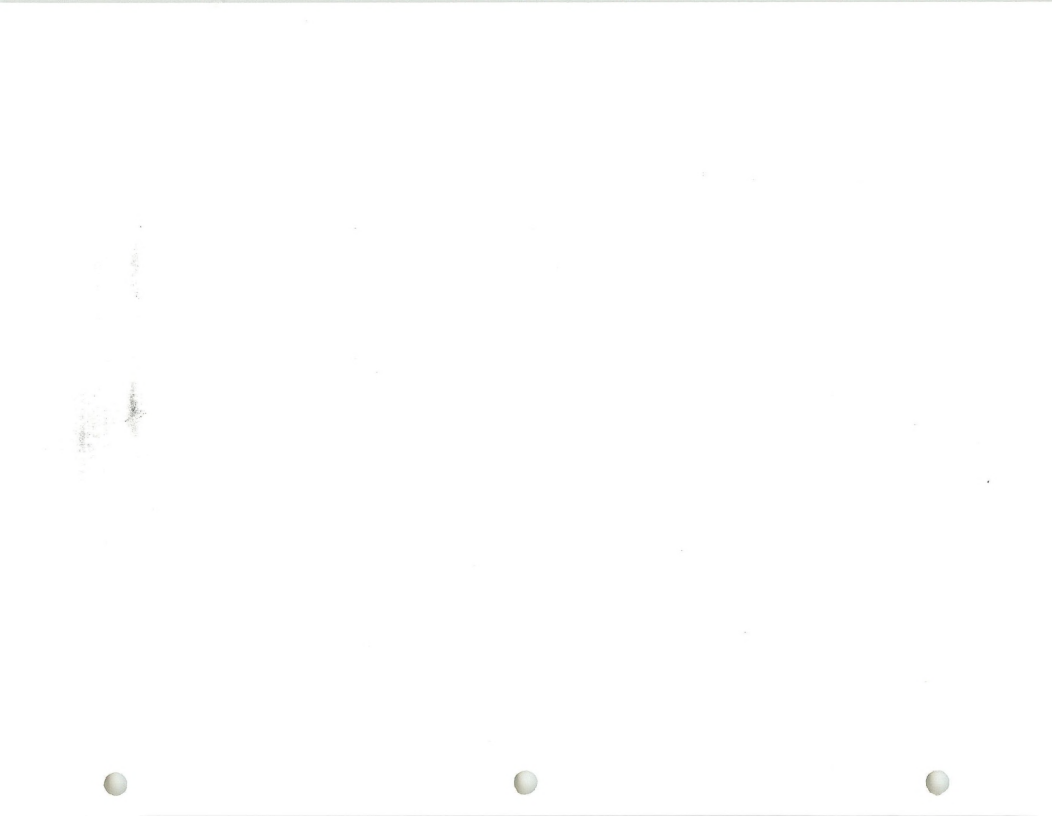
1. Employment projections/forecasts included in this study should be integrated with the 1980 census.
2. Because of the limitations of this study, the employment levels forecast/projected should be incorporated into long-term forecasts and not considered for short-term forecasts without inclusion of seasonal and business cycles.
3. Ideally, the enclosed employment study should be compared to an employment forecast that considers the individual employment components.



TABLE V

MONTANA EMPLOYMENT
(Thousands)

	1970	History 1975	1979	1985	Forecast/Projections		2000
					1990	1995	
<u>Basic Employment</u>							
Agriculture	36.1	34.8	32.2	31.6	31.0	31.0	31.0
Manufacturing	23.8	22.1	27.4	27.0	28.3	29.6	30.9
Mining	6.6	6.4	7.9	5.8	7.9	7.8	9.8
Other Mining				3.4	3.4	2.3	1.6
Energy Impact				1.5	4.5	5.5	8.2
TOTAL BASIC	66.5	63.3	67.5	64.4	67.2	68.4	71.7
<u>Non-Basic Employment</u>							
Construction	11.0	12.1	16.6	22.4	26.4	30.1	34.7
Other Construction				20.3	23.9	27.5	31.1
Energy Impact				2.1	2.5	2.6	3.6
Transportation Public Utilities	17.4	19.0	23.2	25.0	28.0	31.1	34.0
Other				24.7	27.6	30.5	33.4
Energy Impact				.3	.4	.6	.6
Wholesale-Retail Trade	48.1	59.0	75.8	88.1	102.9	117.7	132.5
Finance, Insurance,							
Real Estate	8.1	10.2	13.6	15.6	18.5	21.4	24.3
Services	33.7	44.3	53.4	66.3	78.6	90.8	103.3
Other				66.0	77.7	89.4	101.1
Energy Impact				.3	.9	1.4	2.2
Government	52.6	64.9	70.7	80.1	89.3	98.5	107.6
Other	23.7	29.1	36.5	36.5	36.5	36.5	36.5
TOTAL NON-BASIC	194.6	238.6	289.8	334.0	380.2	426.1	472.9
TOTAL EMPLOYMENT	261.1	301.9	357.3	398.4	447.4	494.5	544.6
TOTAL MONTANA POPULATION	694.4	749.0	784.0	840.0	884.0	924.0	955.0



APPENDIX

MONTANA

ENERGY IMPACT

INTRODUCTION

Employment impacts were derived on an individual project basis. The United States Environmental Protection Agency has issued a package (Bookelt #EPA-908/4-78-0050) to help energy-impacted communities manage growth. The employment figures are estimates based on various actual experiences and may vary among communities and energy facilities.

Using the EPA protection methods is a tool to help understand the general impacts of a new energy employer and is used only as such. Once energy impacts begin and plans are not prepared, it becomes a catch-up game in which correcting mistakes requires a major effort that otherwise could be going toward positive quality features. The population impact will be much greater than the actual employment at a proposed facility. The population associated with the construction phase of a project will be most difficult for a community to provide public services for.³ A large and rapid demand is created for facilities/services and as construction winds down, little time is available to adjust to lower demand for facilities/services.

Hydro-electric power plants were not considered in this energy scenario. Construction forces would be of an economic significance during the construction phases and will be included as projects materialize, but permanent operating force would not be insignificant.



METHODOLOGY

For clarity and simplicity a step by step illustration will be made on the energy impact scenario.

1. Energy Projects in Montana

The State of Montana provided a list of specific energy projects proposed for Montana. Table I has been developed directly from the State of Montana's Applications for Major Facilities. The first item in Table I is Resource 89 and this project will be used for illustrative purposes.

2. Employment Characteristics

The Environmental Protection Agency has devised employment characteristics for energy related activities. Table II illustrates various population figures for various energy developments. The figures from Table II are estimates based on various actual experiences, and may vary among energy facilities.

3. Population Added by Construction and Operations Phases

Using Resource 89 as an illustration, Table I indicates that the facility has a proposed output of 350 megawatt capacity. Table II indicates that for an electrical power plant there will be 1000 construction workers per 1000 megawatts capacity and 130 jobs per 1000 megawatts capacity for the operation phase. The figures derived from the above process is entered into step one on Table III. Table II is then followed from step one to step seven and the results in step seven indicate that a peak population of 1708 persons will be reached during the construction phase and a peak population of 379 will be reached during the operation of the project.

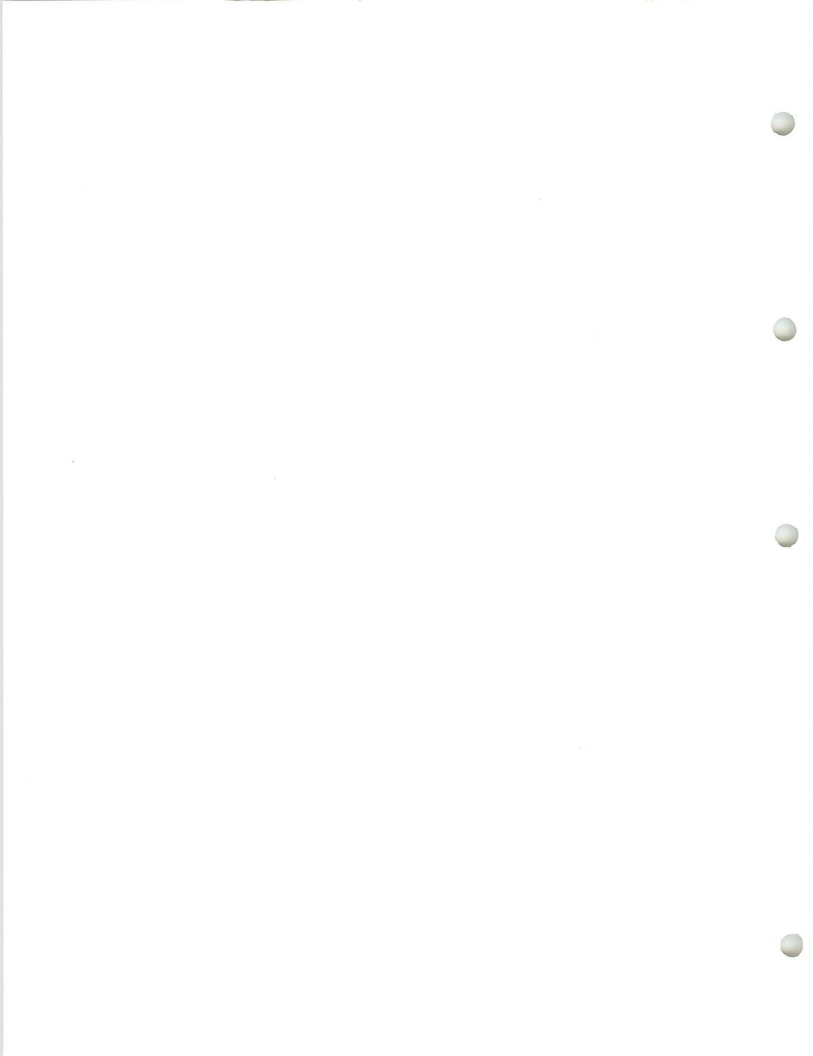


4. Housing, Land Use, Public Facility and Employee Impacts

Populations from both construction and operation phases are then carried over and entered into the population column in Table IV. Not all the columns are appropriate for this study and are not completed.

5. Employment Impact

Construction jobs from Table III, step one, are combined with other specific projects, totaled and added to the employment figures under construction employment. Operational jobs are totaled and added to the employment figures under TCU. Figures from Table III, step four, are totaled and applied as the energy impact to employment levels under service. Also, total employees from Table IV are applied to the employment levels under service employment.



REFERENCES

1. Annual Statewide Labor Force Report for Montana, January, 1978, Research and Analysis Section, Employment Security Division, Department of Labor and Industry, P. 23.
2. The Finance, Insurance, and Real Estate Industries in Montana, Research and Analysis Section, Employment Security Division Section, Department of Labor and Industry, P. 5.
3. Briscoe, Maphis, Murray, Lamont, Inc., "Managing Growth in the Small Community," United States Environmental Protection Agency, 1978, Denver, Colorado, P. 2.
4. Executive Office of the President, Office of Management and Budget, Standard Industrial Classification Manual, 1972.

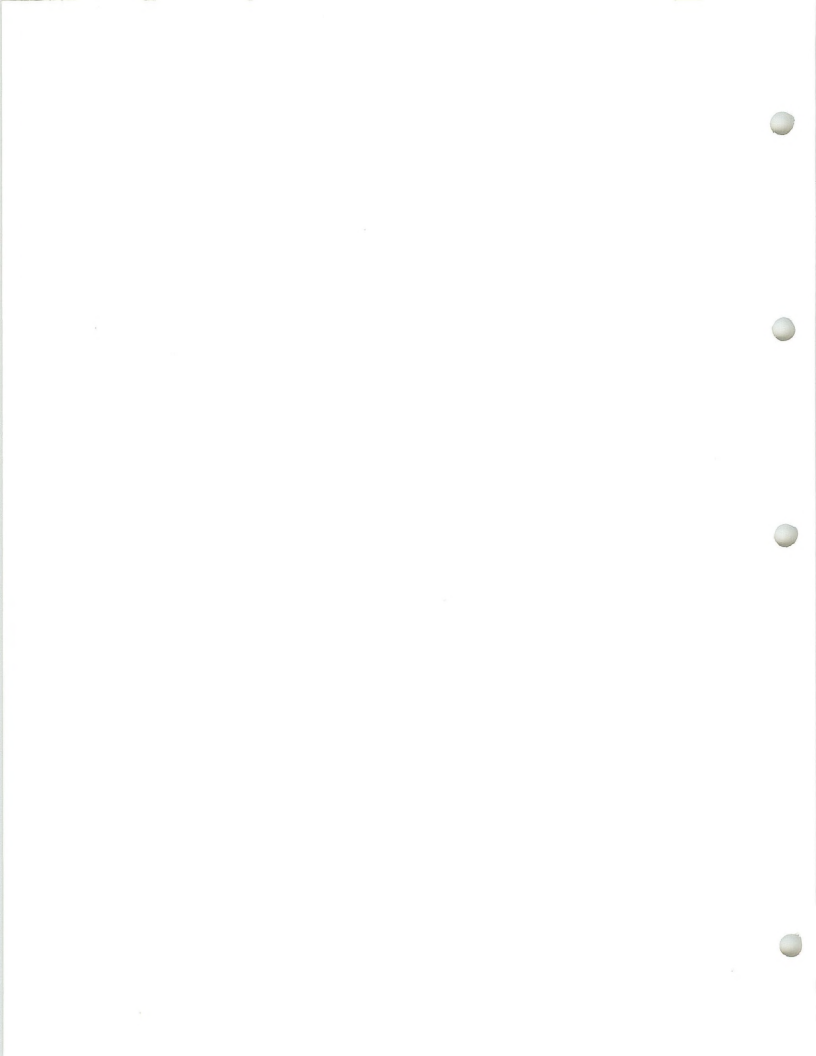


TABLE I - ENERGY PROJECTS IN MONTANA

Major Facilities	Location	Type	Size	Projected Date	Assumed Date Developed By
<u>Utilities</u>					
Resource 89	Unsitd	Coal-Fired Electric	350 MW 350 MW	1981 1986	1985 1990
Unnamed	Unsitd	¹ Combustion Turbines	150 MW 75 MW	1982 1983	1985
Unnamed	Unsitd	² Coal Gasification			1985
Basin Electric Cooperative	McCone County	³ Coal-Fired Electric	500 MW 500 MW	1981	1985 1995
<u>Non-Utilities</u>					
Northern Resources Tenneco	McCone County	Ammonia Methanol Methyl-Fuel Synthetic lignite Diesel Fuel	9.2 Million Tons Per Year		1990
Farmers Potash	Daniels County	Potash Fertilizer	Up to 1 Million Tons Per Year		1985
Washington Energy	McCone County	Coal Gasification	250 MMCF Per Day		1990
Utah International	Powder River Co.	⁴ Coal Gasification	250 MMCF Per Day		2000
Tenneco	Wibaux Co.	⁵ Coal Gasification	250 MMCF Per Day		2000
Northern Powder River Basin Coal	Eastern Montana	⁶ Coal-Strip Mining	56.0 Million Tons by 1990 Per Year		Start 1985

1. Assume coal-fired electrical generating facilities. Possibly an MHD Project.
2. Montana-Dakota Utilities is considering going into partnership.
3. Wyoming is also being considered for siting.
4. Possibly 2 or 3 units assumed only one unit in this study.
5. At least one unit, long-range plans.
6. Actual employment levels and production levels from Draft Environmental Statement for Northern Powder River Basin Coal, Montana.



TABLE II - EMPLOYMENT CHARACTERISTICS

<u>Energy Activity</u>	<u>Construction Phase</u>	<u>Operation Phase</u>
<u>Coal-Strip Mining</u>		
Peak Employment Per 1 Million Tons/Per Year Output	17.5	66
<u>Coal-Underground Mining</u>		
Peak Employment Per 1 Million Tons/Per Year Output	138	345
<u>Electrical Power Plant</u>		
(Coal-Fired, Hydropower, Nuclear) Peak Employment Per 1000 Megawatts Capacity	1000	130
<u>Oil Shale Mining and Processing</u>		
Peak Employment Per 1000 Barrels/ Day Output	33	18
<u>Uranium Mining and Milling</u>		
Peak Employment Per 100 Tons Uranium Concentrate Produced/ Per Day	13	22
<u>Coal Gasification Plant</u>		
Peak Employment Per Million Cubic Foot/Per Day Capacity	4.5	2.4

TABLE III - RESOURCE 90 ONSITE 350 MW 1981
350 MW 1986

POPULATION ADDED BY CONSTRUCTION AND OPERATION PHASES.

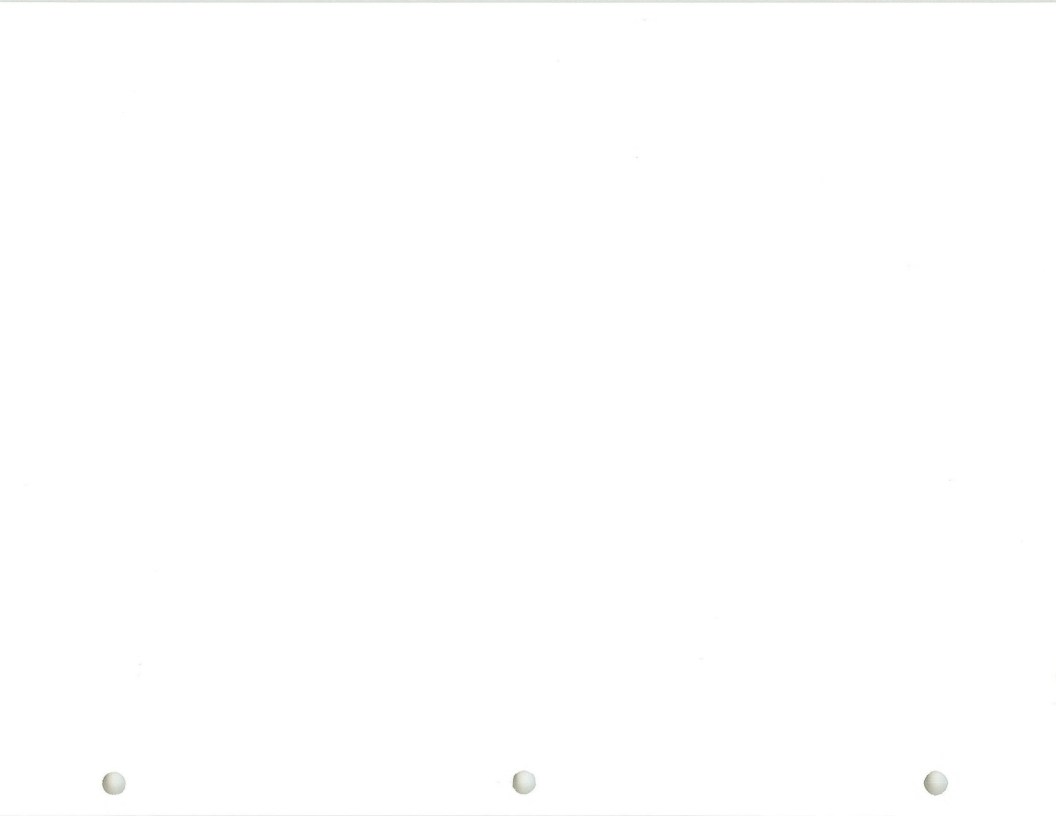
STEP	TO DETERMINE	COMPUTATION	FORMULA	RESULT	
				CONSTRUCTION PHASE	OPERATION PHASE
1	Peak Construction Workers	Multiply the proposed output of the industry times the peak employment per unit of output for the construction phase.	$(.35) \times (1000)$	350	
	Peak Operation Workers	Multiply the proposed output of the industry times the peak employment per unit of output for the operation phase.	$(.35) \times (130)$		46
2	Single Construction Workers	Multiply peak construction workers from Step 1 times the percentage who are single	$(350) \times (0.25)^1$	88	
	Single Operation Workers	Multiply peak operation workers from Step 1 times the percentage who are single	$(46) \times (0.15)^2$		7
3	Married Construction Workers and Families	Multiply peak construction workers from Step 1 times the percentage married times the average family size	$(350) \times (0.75)^1 \times (3.6)^3$	945	
	Married Operation Workers and Families	Multiply peak operation workers from Step 1 times the percentage married times the average family size	$(46) \times (0.85)^2 \times (3.7)^2$		145
4	Peak Service Workers from Construction Phase	Multiply peak construction workers from Step 1 times the service worker ratio	$(350) \times (0.6)^2$	210	
	Peak Service Workers from Operation Phase	Multiply peak operation workers from Step 1 times the service worker ratio	$(46) \times (1.5)^2$		69
5	Single Service Workers from Construction Phase	Multiply peak service workers from Step 4 times the percentage who are single	$(210) \times (0.15)^2$	32	
	Single Service Workers from Operation Phase	Multiply peak service workers from Step 4 times the percentage who are single	$(69) \times (0.15)^3$		10
6	Married Service Workers and Families and Construction Phase	Multiply peak service workers from Step 4 times the percentage married times the average family size	$(210) \times (0.85)^1 \times (3.6)^1$	643	
	Married Service Workers and Families from Operation Phase	Multiply peak service workers from Step 4 times the percentage married times the average family size	$(69) \times (0.85)^1 \times (3.7)^2$		217
7	TOTAL added Population from Construction Phase	Add only the results contained in the boxes	Add results of Steps 2, 3, 5 and 6	1708	
	TOTAL added Population from Operation Phase	Add only the results contained in the boxes	Add results of Steps 2, 3, 5 and 6		379

1 Mountain West Research, Inc., Construction Worker Profile. A study for the Old West Regional Commission, 1975.

2 Department of Housing and Urban Development, Rapid Growth from Energy Projects, Ideas Not Yet in the Energy Action, 1974.

3 Assumed to be the same as for the construction phase.

NOTE: Service worker ratios include public employees.



CONSTRUCTION PHASE					OPERATION PHASE					
Project	Actual Population Divided by 100	Acres	Land Required	Facilities Required	Employees Required	Actual Population Divided by 100	Acres	Land Required	Facilities Required	Employees Required
Elementary School	17.1	X 0.26 ¹ X 0.41 ² X 1.14 ³	_____ acres	_____ classrooms	19 employees (total)	3.3	X 0.26 ¹ X 0.41 ² X 1.14 ³	_____ acres	_____ classrooms	4 employees (total)
Secondary School		X 0.17 ¹ X 0.54 ² X 1.74 ³	_____ acres	_____ classrooms	30 employees (total)		X 0.17 ¹ X 0.54 ² X 1.74 ³	_____ acres	_____ classrooms	7 employees (total)
Water Supply		X 0.1 ¹ X 20 ² X 0.945 ³	_____ acres	_____ acre ft./year capacity	1 employees		X 0.1 ¹ X 20 ² X 0.945 ³	_____ acres	_____ acre ft./year capacity	_____ employees
Wastewater Treatment		X 0.1 ¹ X 10,000 ² X 0.121 ³	_____ acres	_____ gallons treatment capacity	2 employees		X 0.1 ¹ X 10,000 ² X 0.121 ³	_____ acres	_____ gallons treatment capacity	_____ employees
Housing (12.45 People/Dwelling) Permanent (4 DU/Acre)		X 4.0 ¹ X 16 ²	_____ acres	308 housing units	N/A		X 5.4 ¹ X 22.5 ²	_____ acres	86 housing units	N/A
Temporary (4 DU/Acre)		X 1.25 ¹ X 10 ²	_____ acres	171 housing units	N/A		X 0.75 ¹ X 6 ²	_____ acres	23 housing units	N/A
Other (13 DU/Acre)		X 0.13 ¹ X 2 ²	_____ acres	34 housing units	N/A		X 0.93 ¹ X 9 ²	_____ acres	housing units	N/A
Police Protection		X 0.204 ¹ X 20 ² X 0.64 ³ X 0.227 ⁴	_____ acres	_____ sq. ft. station _____ vehicles	4 police officers		X 0.024 ¹ X 20 ² X 0.04 ³ X 0.227 ⁴	_____ acres	_____ sq. ft. station _____ vehicles	1 police officers
Fire Protection		X 0.001 ¹ X 0.128 ²	_____ acres	_____ fire stations	2 fire fighters		X 0.001 ¹ X 0.128 ²	_____ acres	_____ fire stations	_____ fire fighters
Hospital		X 0.025 ¹ X 0.4 ² X 0.189 ³	_____ acres	_____ hospital beds	3 doctors		X 0.025 ¹ X 0.4 ² X 0.189 ³	_____ acres	_____ hospital beds	_____ doctors
General Government		X 0.024 ¹ X 20.4 ² X 40.8 ³ X 0.183 ⁴	_____ acres	_____ sq. ft. offices _____ sq. ft. garage	2 employees		X 0.024 ¹ X 20.4 ² X 40.8 ³ X 0.183 ⁴	_____ acres	_____ sq. ft. offices _____ sq. ft. garage	_____ employees
Solid Waste Disposal		X 0.86 ¹ X 0.06 ²	N/A	_____ acre ft./year of land-fill capacity	1 employees		X 0.16 ¹ X 0.06 ²	N/A	_____ acre ft./year of land-fill capacity	_____ employees
Parks/Recreation		X 1.0 ¹ X 0.945 ²	_____ acres	_____ facilities	_____ employees		X 1.0 ¹ X 0.945 ²	_____ acres	_____ facilities	_____ employees
Libraries		X 0.014 ¹ X 55.0 ² X 100.0 ³ X 0.026 ⁴	_____ acres	_____ sq. ft. library space _____ books	_____ employees		X 0.014 ¹ X 55.0 ² X 100.0 ³ X 0.026 ⁴	_____ acres	_____ sq. ft. library space _____ books	_____ employees
Commercial Land		X 0.117 ¹	_____ acres	N/A	N/A		X 0.117 ¹	_____ acres	N/A	N/A
Industrial Land		X 1.2 ¹	_____ acres	N/A	N/A		X 1.2 ¹	_____ acres	N/A	N/A
Others		X () X () X ()	_____ acres	_____ employees	_____ employees		X () X () X ()	_____ acres	_____ employees	_____ employees
Subtotal Streets		X 0.04	N/A	_____ linear miles of street right of way***	N/A		X 0.04	N/A	_____ linear miles of street right of way***	N/A
Multiply subtotal on acreage by 1.3 to obtain total acreage including acreage and right of way					Multiply subtotal on acreage by 1.3 to obtain total acreage including acreage and right of way					
Total		_____ Acres	N/A	67 Employees***		_____ Acres	N/A	11 Employees***		



STANDARD INDUSTRIAL CLASSIFICATION

SIC

All the data used in this employment forecast has been classified from the Standard Industrial Classification Code and originating from the Employment and Labor Force Report, Research and Analysis Section, Helena, Montana.

A brief definition of the SIC and definitions of each classification is:

A Standard Industrial Classification was developed for use in the classification of establishments by type of activity in which they are engaged, for purposes of facilitating the collection, tabulation, presentation and comparability in the presentation of statistical data collected by various agencies of the United States Government, state agencies, trade associations and private research organizations.

AGRICULTURE

This division includes establishments engaged in agricultural production, forestry, commercial fishing, hunting and trapping and related services.⁴

Establishments covered:

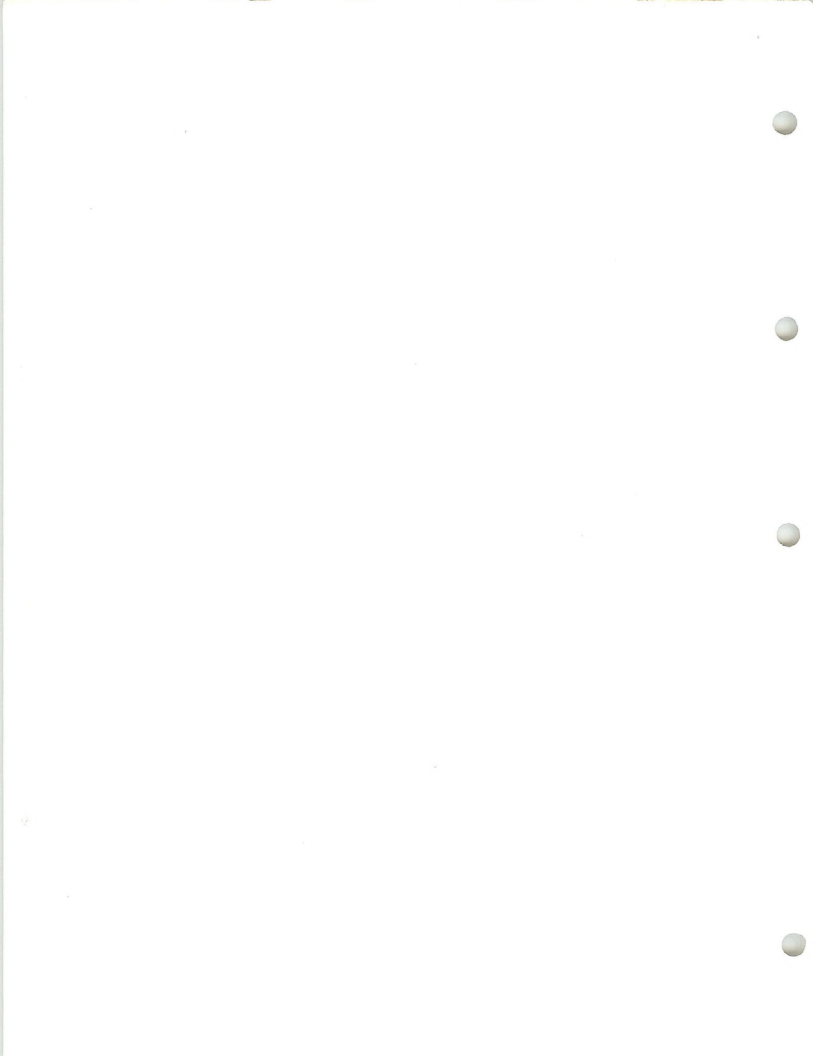
- Farms
- Ranches
- Dairies
- Greenhouses
- Nurseries
- Orchards
- Hatcheries
- Commercial Hunting and Trapping

Which produce:

- Crops
- Plants
- Vines
- *Trees (Excluding forestry operations)
- Livestock
- Livestock Products
- Sod
- Seed

Data used for measurement is value of production.

Logging camps and logging contractors are classified in Industry.



SICAGRICULTURE (Cont'd.)Major Groups:

Agricultural Production (Crops)
 Agricultural Production (Livestock)
 Forestry

MANUFACTURING

The manufacturing divisions include establishments engaged in the mechanical or chemical transformation of materials or substances into new products. These establishments are usually described as plants, factories, or mills and use power-driven machines and materials handling equipment. Also included is the blending of materials such as lubrication oils, plastics, resins or liquors.

There are numerous borderline cases between manufacturing and other divisions of classification. The following are classified as Manufacturing:

Milk Bottling and Pasteurization
 Fresh Fish Packing
 Apparel Jobbing
 Publishing

Ready-mix Concrete Production
 Leather Converting
 Logging
 Wood Preserving

Data used for measurement is value of receipts or revenues.

Major Groups:

Food and Kindred Products
 Tobacco Manufacturers
 Textile Mill Products
 Lumber and Wood Products
 Furniture and Fixtures
 Paper and Allied Products
 Chemicals and Allied Products
 Leather and Leather Products
 Primary Metal Industries
 Fabrication Metal Products
 Machinery
 Equipment and Supplies
 Transportation Equipment
 Measuring, Analyzing and
 Controlling
 Miscellaneous Manufacturing
 Industries

Apparel and Other Finished
 Products made from Fabrics
 and Similar Materials
 Printing, Publishing and Allied
 Industries
 Petroleum Refining and Related
 Industries
 Rubber and Miscellaneous
 Plastic Products
 Stone, Clay, Glass and Concrete
 Products
 Electrical and Electronic
 Machinery
 Instruments, Photographic,
 Medical, Optical Goods and
 Watches and Clocks.

SICMINING

This division includes all establishments primarily engaged in mining. Mining is used in the broad sense to include:

- Coal and Ores
- Crude Petroleum
- Natural Gases
- Quarrying
- Well Operations
- Milling (Crushing, screening and washing)
- Exploration and Development of Mineral Properties
- Services for Operations

Data used for measurement is value of Production.

Major Groups:

- Metal Mining
- *Anthracite Mining
- Bituminous Coal and Lignite Mining
- Oil and Gas Extraction
- Mining and Quarrying of Non-Metallic Minerals

CONSTRUCTION

This division includes establishments (or kind-of-activity units) primarily engaged in construction. The term "construction" includes new work, additions, alterations and repairs. Construction activities are generally administered or managed from a relatively fixed place of business, but the actual construction work is performed at one or more different sites which may be dispersed geographically. If there is more than one fixed place of business, each location maintaining data on employees is considered a separate construction establishment.

Three broad types of construction activity are covered:

1. Building construction by general contractors or operative builders.
2. Other construction by general contractors.
3. Construction by special trade contractors.

Data used for measurement is value of production.

*Hard Coal

SICTransportation, Communications, Electric, Gas and Sanitary Services

This division includes establishments providing passenger and freight transportation, communication services, electricity, gas, steam, water or sanitary services, and the U. S. Postal Service.

For this division, the establishment is represented by a relatively permanent office, shop, station, terminal, warehouse, etc., which supervises activities:

Data used for measurement is value of sales.

Major Groups:

- Railroad Transportation
- Local and Suburban Transit and Interurban Highway
- Passenger Transportation
- Motor Freight Transportation and Warehousing
- U. S. Postal Service
- Water Transportation
- Transport by Air
- Transportation Services
- Communications
- Electric, Gas and Sanitary Services

Wholesale and Retail Trade

Wholesale includes establishments or places of business primarily engaged in selling merchandise to retailers; to industrial, commercial, institutional, farm or professional business users or to other wholesalers; or acting agents or brokers in buying merchandise for or selling merchandise to such persons or companies.

The principal types of establishments included are:

- Merchant Wholesalers
- Sales Branches and Sales Offices
- Petroleum Bulk
- Assemblers, buyers, and Associations Engaged in the Cooperative Marketing of Farm Products

The chief functions of establishments included in wholesale trade and selling goods to trading establishments.

Retail trade includes establishments engaged in selling merchandise for personal or household consumptions, and rendering services incidental to the sale of goods. In general, retail establishments are usually places of business and are engaged in activities to attract the general public to buy.



SICWholesale and Retail Trade (Cont'd)

Data used for measurement is value of sales.

Major Groups Include:Wholesale Trade

Durable Goods

Non-Durable Goods

Retail Trade

Building Materials, Hardware, Garden Supplies

and Mobile Home Sellers

General Merchandise Stores

Food Stores

Automotive Dealers and Gasoline Service Stations

Apparel and Accessory Stores

Furniture, Home Furnishings and Equipment Stores

Eating and Drinking Places

Miscellaneous Retail

Finance, Insurance, and Real Estate

This division includes establishments operating primarily in the fields of finance, insurance, and real estate. Financial includes:

Banks

Credit Agencies

Trusts

Brokers

Dealers in Securities

and Commodity Contracts

Security and Commodity

Exchanges

Insurance covers carriers of all types of insurance, and insurance agents and brokers.

Real Estate includes owners, lessors, lessees, buyers, sellers, agents, and developers of real estate.

Data used for measurement is value of receipts.

Major Groups Include:

Banking

Credit Agencies

Security and Commodity Brokers

Dealers, Exchanges and Services

Insurance

Insurance Agents, Brokers, and Services

Real Estate

Combinations of Real Estate, Insurance, Loans, Law Offices

Holding and other Investment Offices

SICServices

This division includes establishments primarily engaged in providing a wide variety of services for individuals, business and government establishments, and other organizations. Establishments which provide specialized services closely allied to agriculture, mining, transportation, etc., are classified in their respective divisions.

Data used for measurement is value of receipts or revenue.

Major Groups Include:

Hotels, Rooming Houses, Camps, and Other Lodging Places.
 Personal Services
 Business Services
 Automotive Repair, Services, and Garages
 Miscellaneous Repair Services
 Motion Pictures
 Amusement and Recreational Services
 Health Services
 Educational Services
 Social Services
 Museums, Art Galleries
 Botanical and Zoological Gardens
 Membership Organizations
 Private Housing
 Miscellaneous Services

Public Administration (Government)

This division includes the legislative, judicial, administrative, and regulatory activities of Federal, state and local and international governments. Government owned and operated business establishments are classified in the divisions according to the activities in which they are engaged.

Data used for measurement is employment or payroll.

Major Groups Include:

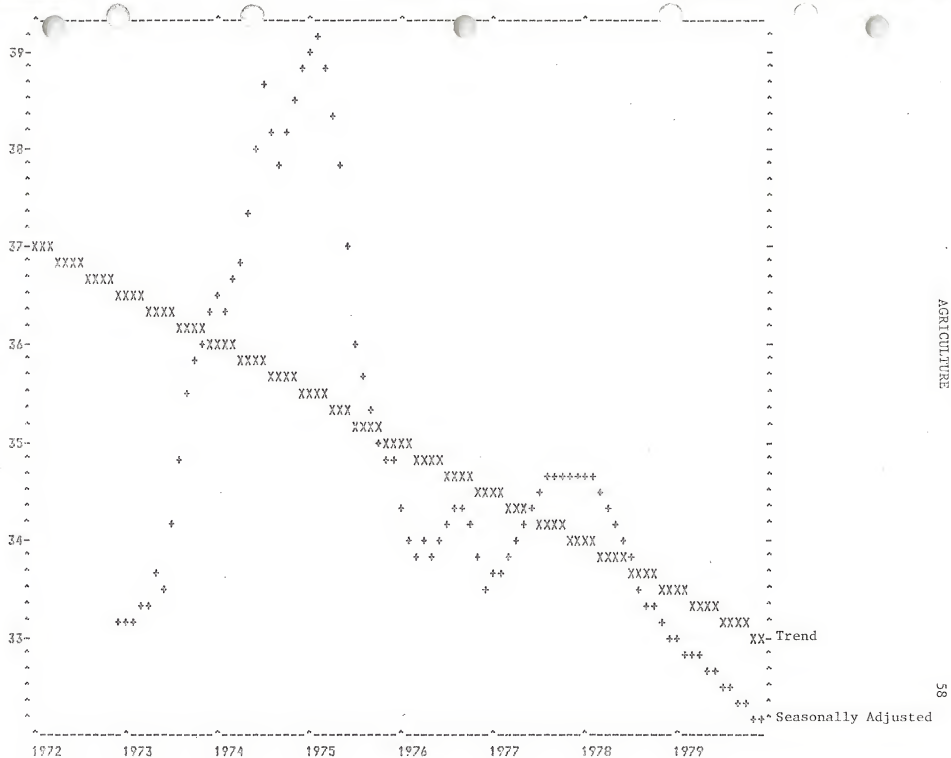
Executive, Legislative and General Government
 Justice, Public Order and Safety
 Public Finance, Taxation, and Monetary Policy
 Administration of Human Resources Programs
 Administration of Environmental Quality and Housing Programs
 Administration of Economic Programs
 National Security and International Affairs

SICNON-CLASSIFIABLE ESTABLISHMENTS (Other)

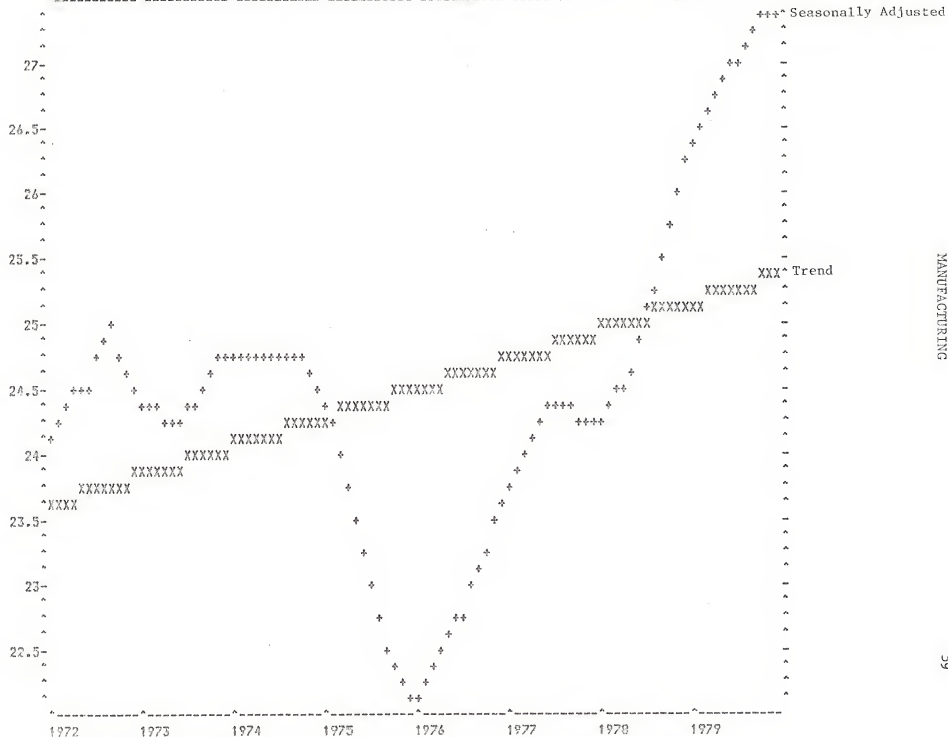
This major group includes establishments which cannot be classified in any other industry.

The State of Montana provides employment data on a monthly basis. Two basic concepts enter the picture on the Employment and Labor Force Report: the "employed persons" is a count of people, the "Non-Farm Wage and Salary Jobs" category is a count of jobs. Methodology has been to add up the count of jobs (including agriculture) and subtract the total jobs from the employed persons. The resulting figure has been categorized in Other.

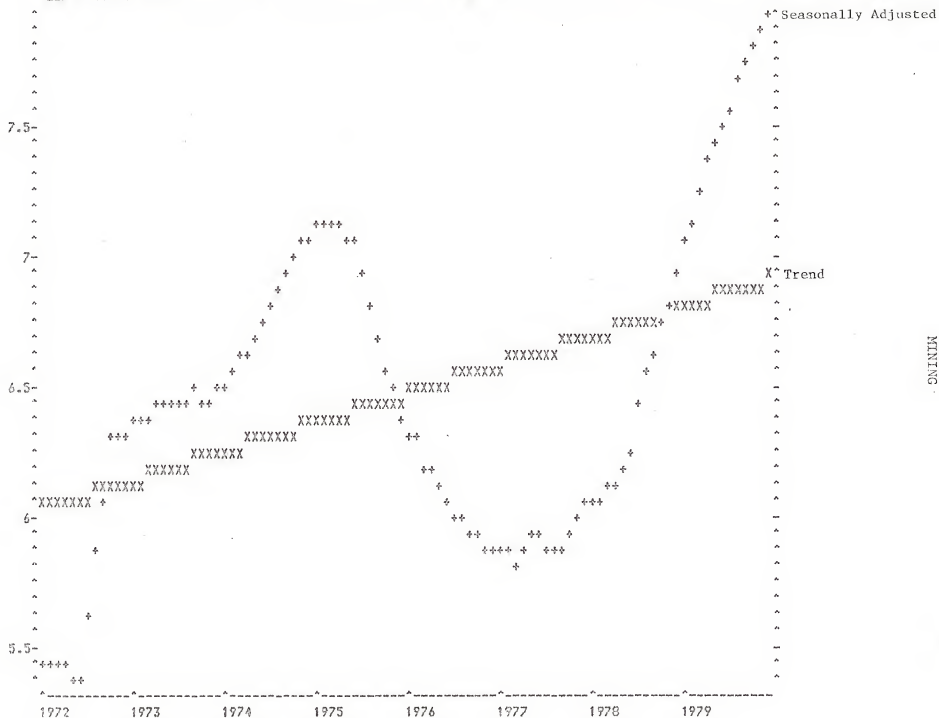
Included in the Other category would be self-employed persons not accountable to the State of Montana for Unemployment Insurance, unpaid domestic help and unpaid family members. A sampling result is included in that a self-employed person may hold more than one job with a resultant overcount.

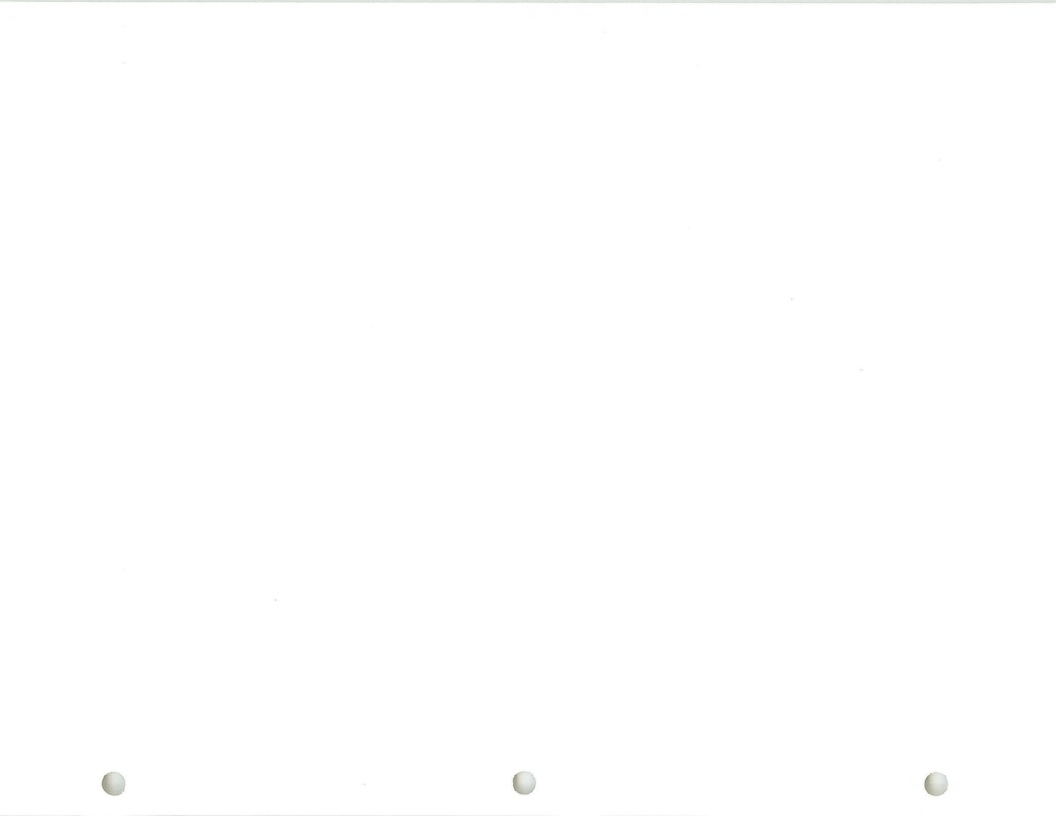


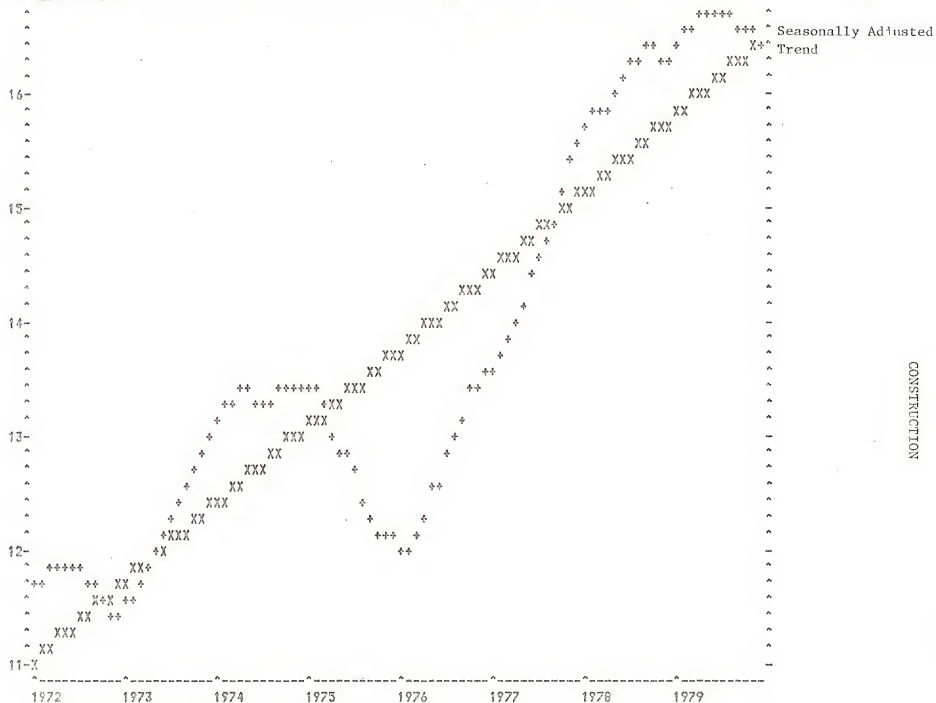






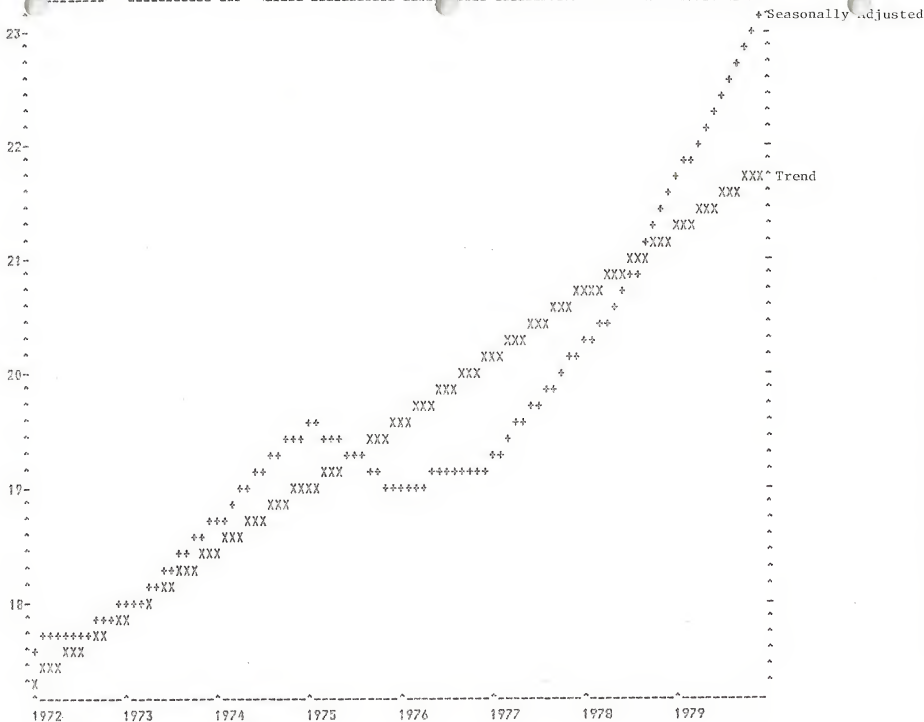




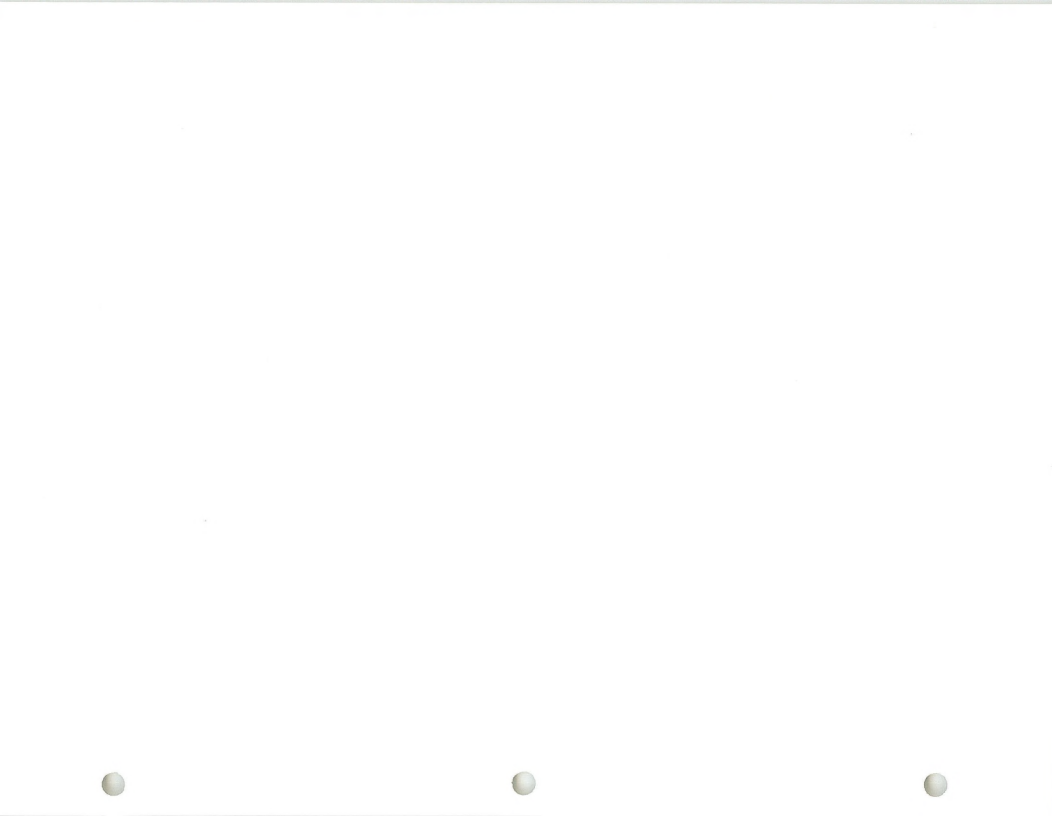


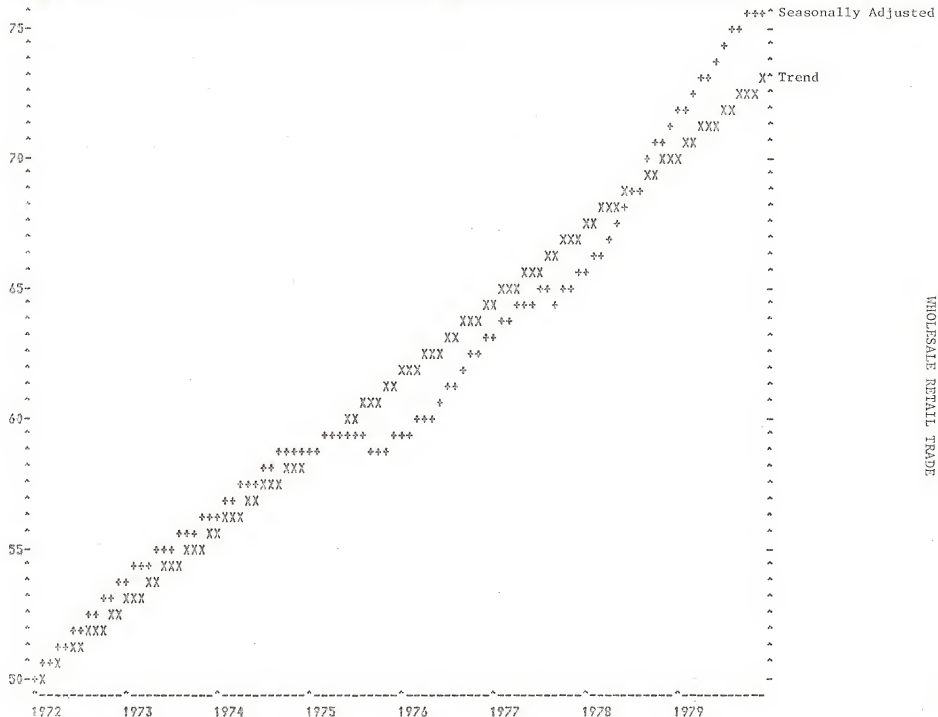
CONSTRUCTION

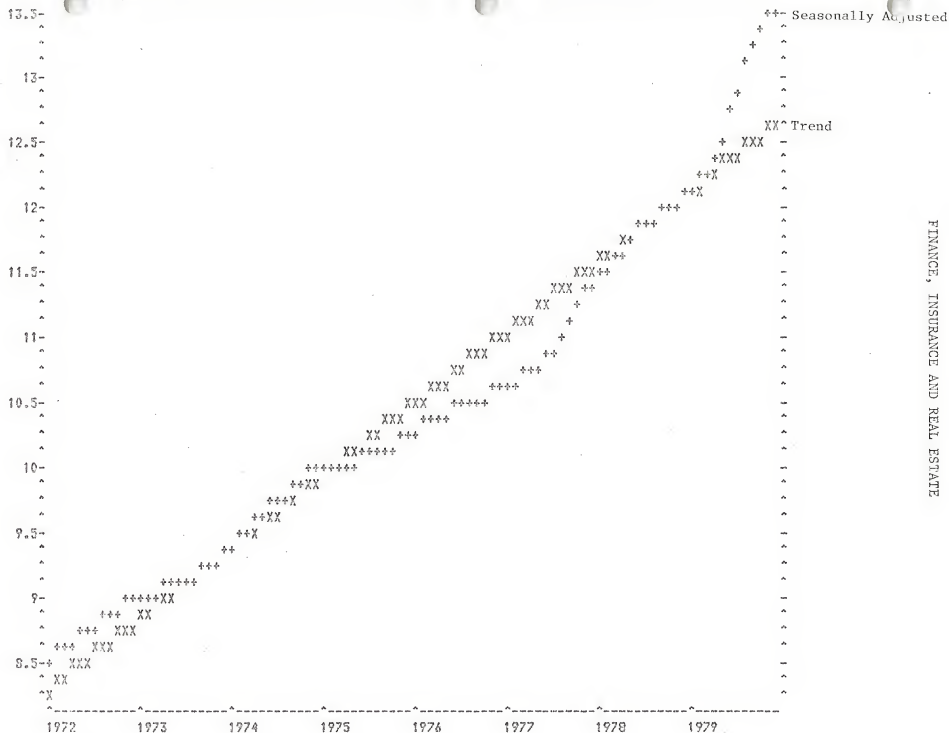


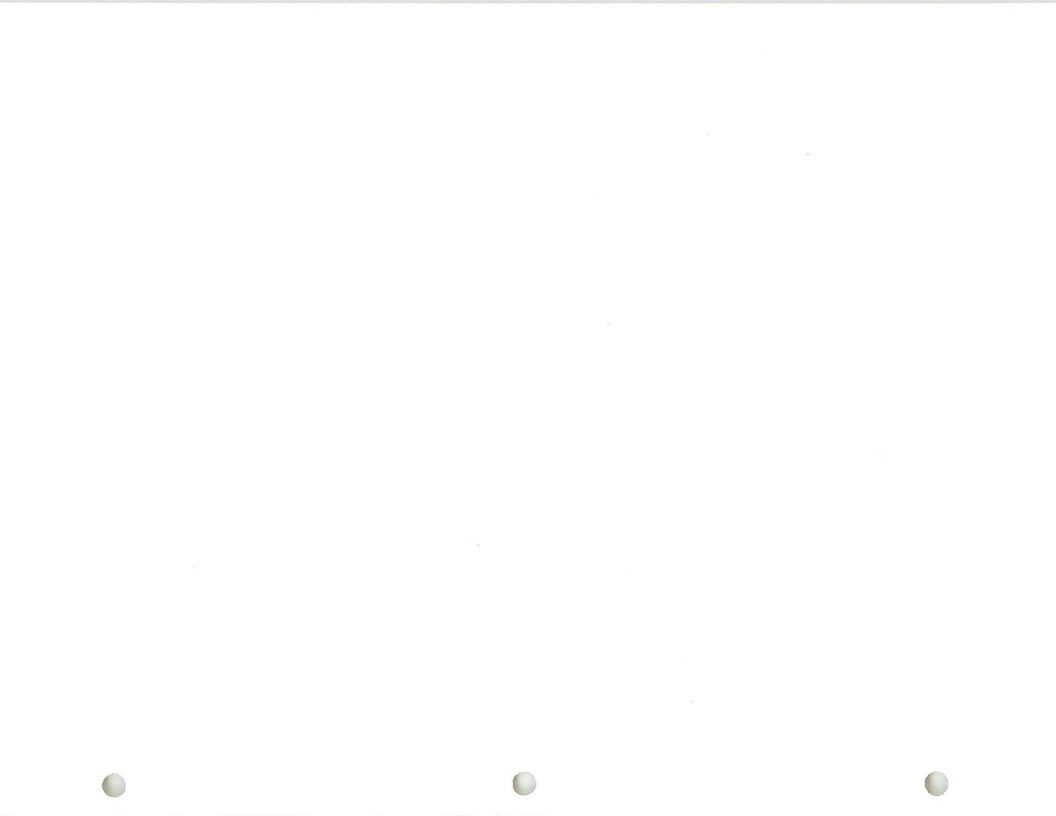


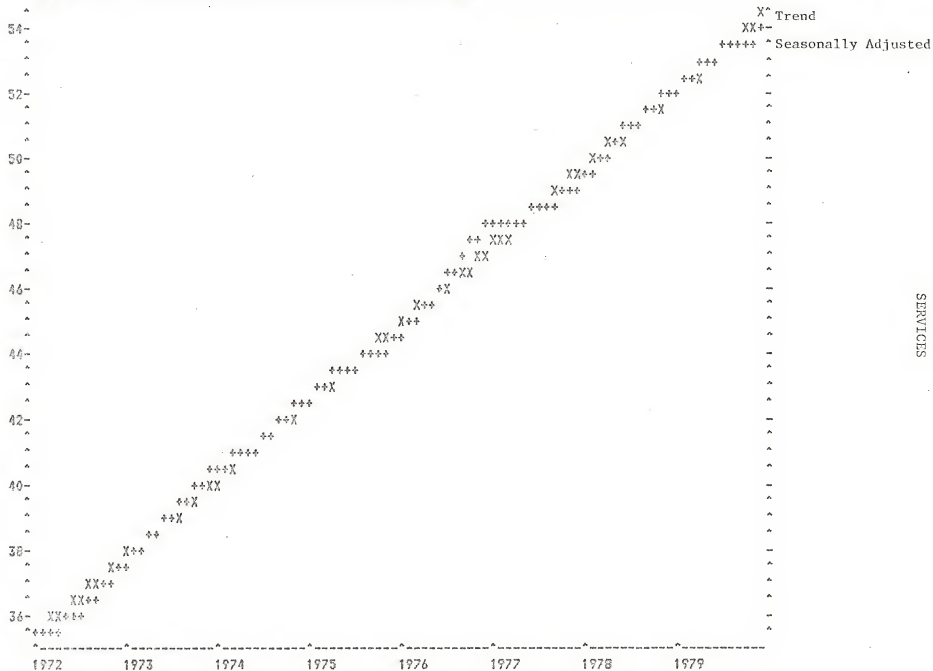
1 + DATATCUM 2 X PRDNTCUM VS TIME
JAN 1972-DEC 1979





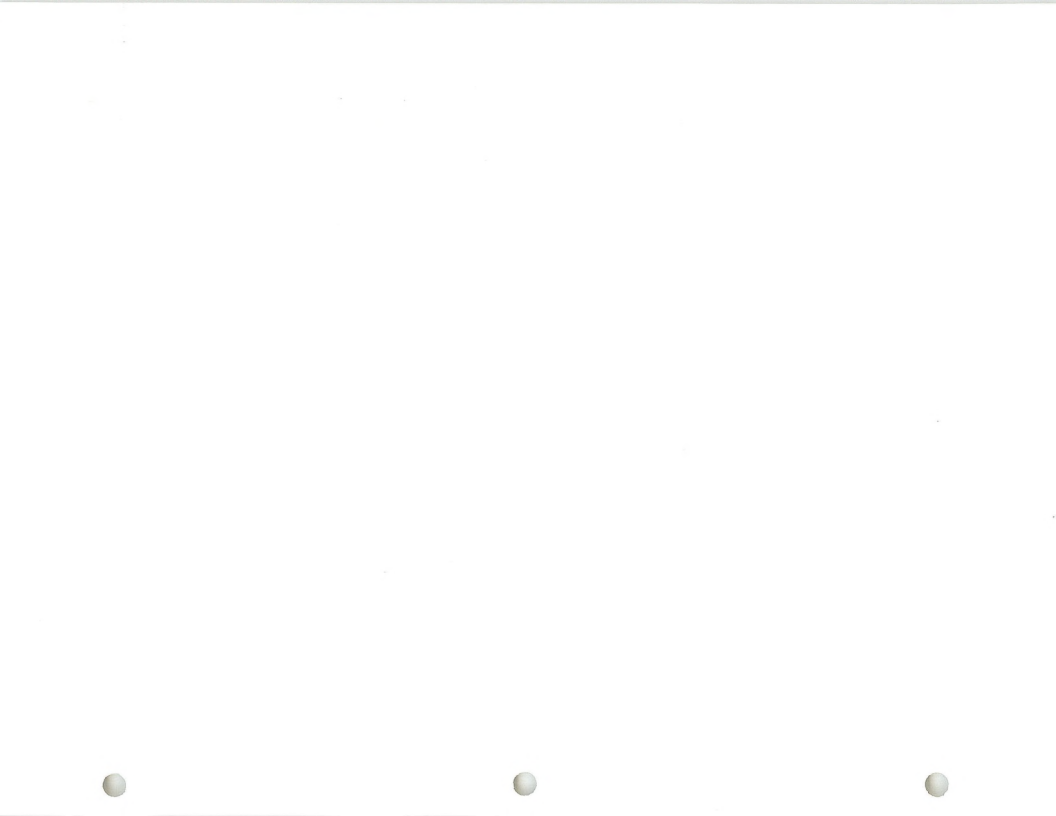


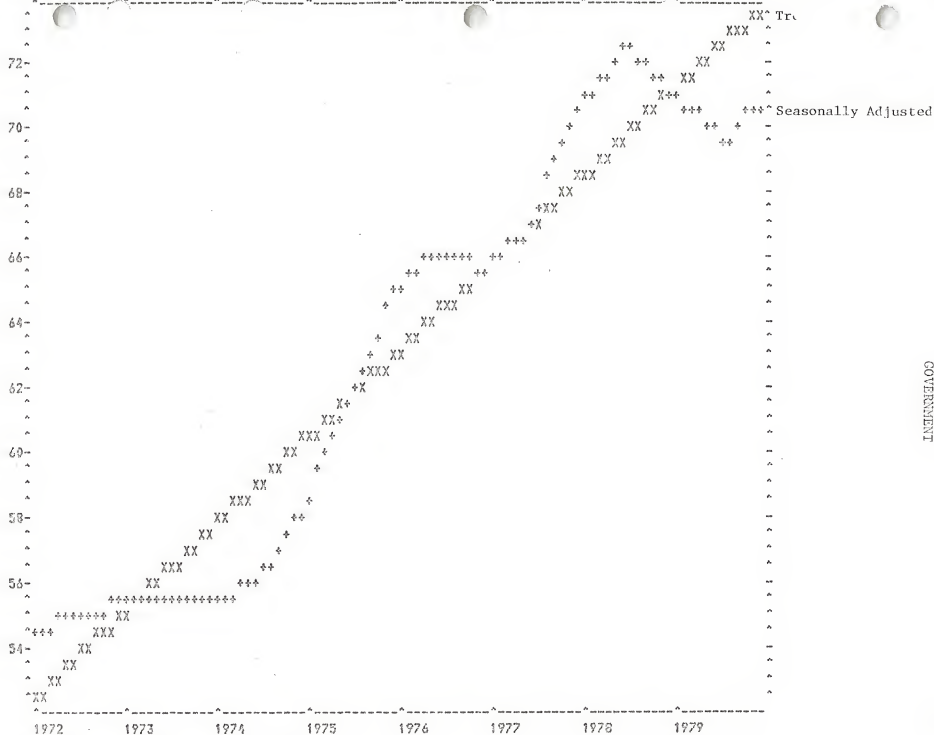




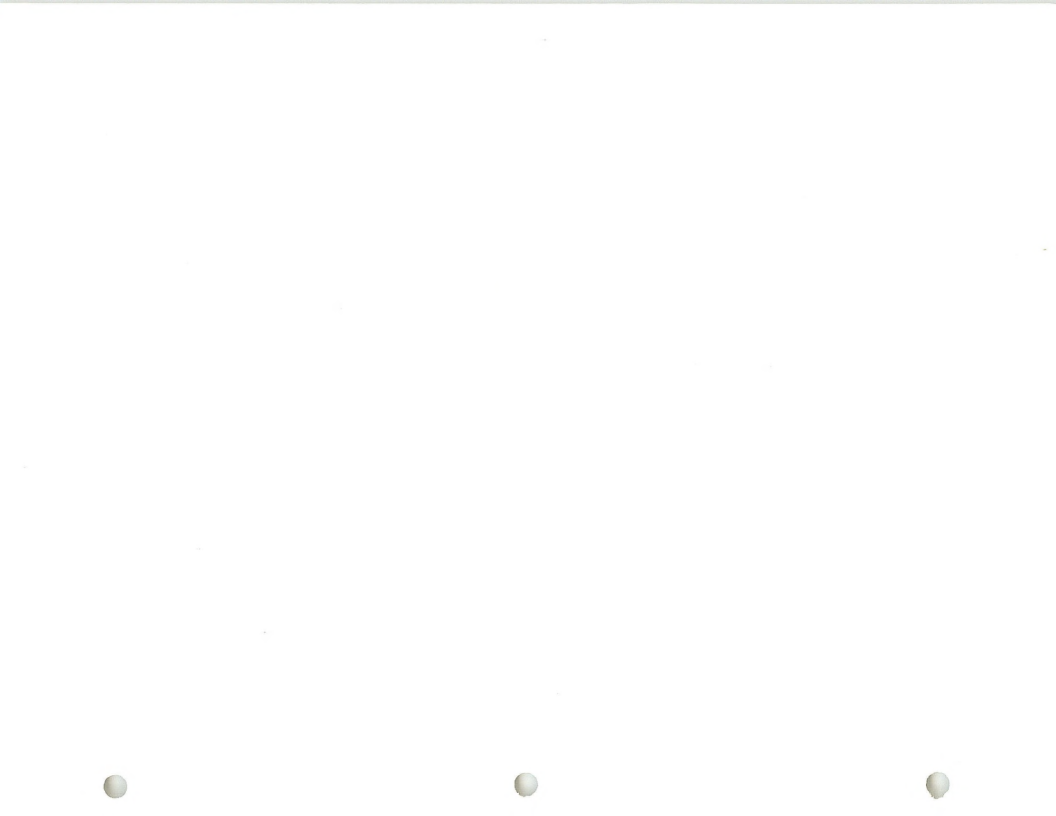
SERVICES

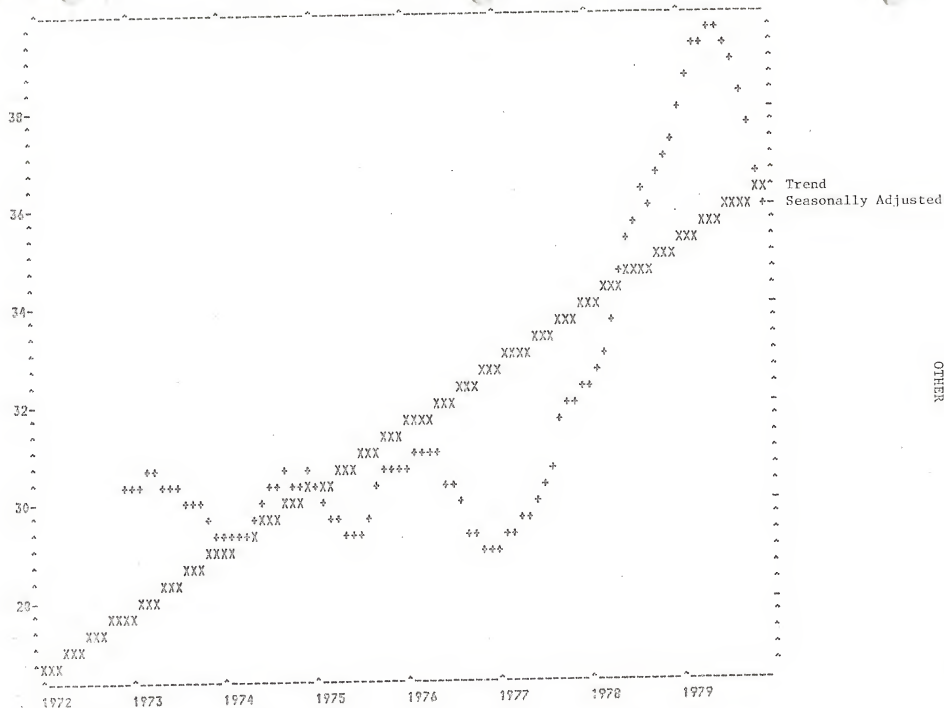
1 + DATASERN 2 X PRDNERN VS TIME
JAN 1972-DEC 1979





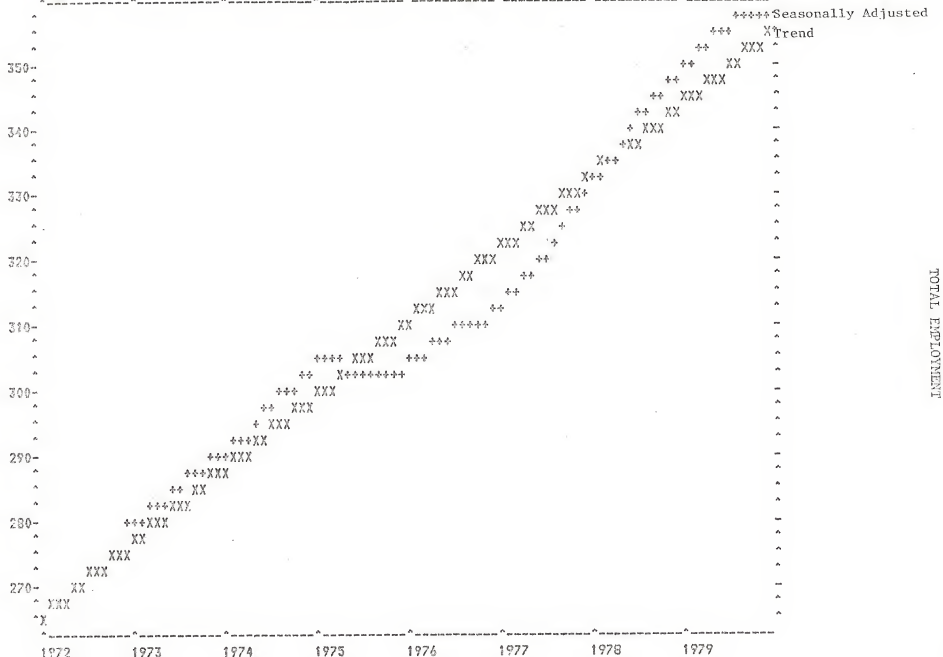
GOVERNMENT





OTHER





1 + DATATEMM 2 X PRDNTMM VS TIME
JAN 1972-DEC 1979

